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CATALOGUE

OF THE

STORAGE

MINERALS AND ROCKS

IN THE

COLLECTION

OF THE

AUSTRALIAN MUSEUM.

BY

GERARD KREFFT, F.L.S., &c.,
CURATOR AND SECRETARY.

SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1873.

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ERRATA.

Page 29. *For* "Stralstein" *read* "Strahlstein."
,, 30. *For* "Tassaite" *read* "Fassaite."
,, 30. *For* "Almadine" *read* "Almandine."
,, 48. *For* "Phyrrhosiderite" *read* "Pyrrhosiderite."
,, 49. *For* "from the blow-pipe" *read* "before the blow-pipe."
,, 58. *For* "Argyrithrose" *read* "Argyrythrose."
,, 63. *For* "Menindie" *read* "Merrendee, Stony Creek."
,, 80. *For* "Dysodyle" *read* "Disodyle."
,, 96. *For* "Schiste" *read* "Schist."
,, 114. *For* "Cryalite" *read* "Cryolite."

PREFACE.

The object of this Catalogue is to give a list of the Minerals and Rocks in the Australian Museum, exhibited for public inspection. The whole series is a much larger one than the one now on view; but more cabinets are required to make the remaining portion accessible to the public. With a liberal supply of show cases, the collection will be less crowded in future; it will be possible then to give on a card full information, in large type, about every individual specimen, and furnish extra cabinets of "working series," for visitors who take a special interest in Mineralogy. Compilations useful to the miner and mineral explorer, from the late Professor A. M. Thomson's book, from Professor Dana's, Messrs. Bristow's, Clarke's, Selwyn's, Ulrich's, and Bernhard von Cotta's works, have been added. Descriptions of all the useful minerals are also supplied, and hints given how to test them. The foreign specimens named and classified were purchased of Monsieur Louis Sæmann, of Paris: the Australian section being determined by the late Professor A. M. Thomson, whose early death was a serious loss to this institution, whereof he was a Trustee. I suppose I may express the hope that the public—for whose benefit this Catalogue is printed—will kindly support the undertaking, so that similar lists of the many valuable and

interesting objects exhibited in the Australian Museum may soon follow. Publications of this kind will prove to the World that there are noble foundations for the instruction of youth in this Country; and the knowledge of their presence cannot fail, to some extent, to influence immigration. It is necessary to point this out, because, in the last official work, whereof 50,000 copies were printed for distribution in Europe, the existence of this, *the oldest and the richest Museum of all the Australian Colonies*, was passed over in silence. I take the opportunity to inform those interested, that the institution is still flourishing, that it has been visited last year by nearly 250,000 persons, admitted free on every lawful day, and who can best show their gratitude by forwarding specimens of all kinds, and by a liberal purchase of the scientific publications of New South Wales.

August 30th, 1873.

Arrangement of the Minerals, Metals, and Rocks, in the Australian Museum, exhibited in the old Hall, near the entrance, in seven Table Cases, and in the following order :—

A.—MINERALS AND METALS.

In four Table Cases, one on each side of the centre Desk Cases and running parallel with them, the following Minerals are on view :—

MINERAL CASE 1.

(Commencing opposite the Ruminant skeletons)—Quartz and Silicates, 1 to 372.

MINERAL CASE 2.

Hydrous Silicates, Anhydrous Carbonates, Hydrous and Anhydrous Phosphates and Sulphates, Nitrates, Fluorids, Chlorids, and the beginning of the Metallic Ores, 373 to 712.

MINERAL CASE 3.

Iron, 713 to 776. Cobalt, 777 to 786. Nickel, 787 to 790. Zinc, 791 to 819. Lead, 820 to 833. Tin, 834 to 856. Mercury, 857 to 861. Silver, 862 to 876. Gold, 877 to 880. Australian Gold under separate numbers.

MINERAL CASE 4.

Alluvial Gold, 21 to 42. Copper, 881 to 932. Uranium, 933 to 936. Bismuth, 937 to 940. Tin, 941 to 948. And extra Australian specimens—Titanium, 949 to 954. Wolfram, 955 to 957. Scheelite, 958 to 962. Molybdenite, 963. Tantalates, 964 to 967. Antimony, 970 to 981. Arsenic, 982 to 984. Sulphur, 985 to 988. Carbon, 989 to 997. Resins, 998 to 1000.

B.—THE ROCKS.

The three Centre Cases, between the clock and the entrance door, contain the collection of Rocks.

ROCK CASE 1.

(Beginning opposite the door near the clock.)—Basic igneous Rocks—Volcanic series, 1 to 44; Plutonic series, 45 to 124. Acidic igneous Rocks—Volcanic series, 125 to 147; Plutonic series, 148 to 264.

ROCK CASE 2.

Acidic igneous Rocks—Plutonic series, 266 to 286. The whole of the series contained in Case 1 and part of Case 2, from 1 to 331, comprises the Basaltic Rocks, the Greenstones, Melaphyre, Porphyrite, Mica-trap, Syenite, Trachyte, Clinkstone, Granite, Pitchstone, Felspar, Quartz, Chlorite, Hornblende, and Mica-schist groups. The Sedimentary Rocks, such as Clay, Slate, Marl, Sandstone, Limestone, and Conglomerates, are numbered from 332 to 594.

ROCK CASE 3.

This case contains the rest of the Sandstones and Conglomerates, from 511 to 594, and the miscellaneous Rocks not before enumerated. Breccia, Lava, Tufa, Serpentine, Greisen, Schorl, and other Tin-bearing Rocks, 595 to 631. Peat, Lignite, Bitumen, Mineral Coal, and Anthracite, 632 to 638; and such *minerals* which occur in large masses, and enter considerably into the formation of the earth's crust. This closes the Mineral and Rock series in the Old Hall. The Geological specimens will be found on the first floor in the Centre Room of the New Building.

ADDENDA.

The following specimens, not enumerated in the Catalogue, will be found in their respective places in the collection :—

Precious opal, from Cooper's Creek.

Zinc ore, containing lead, silver, and cadmium, from Queensland.

Arsenical pyrites, containing 500 oz. gold per ton, from Lucknow, New South Wales.

Iron pyrites, containing 20 to 75 oz. silver per ton, from the Clarence River, New South Wales.

Cinnabar in limestone, from Kilkeren, New South Wales.

Drift cinnabar, from Kilkeren, New South Wales.

Presented by S. L. Bensusan, Esq.

Specimens illustrative of the "drift," from the diamond mines of New South Wales :—

1. Diamond from Bingera.
2. Diamond from Bingera.
3. Specimen of diamond drift No. 1.
4. „ „ „ „ 2.
5. „ „ „ „ 3.
6. „ fine gem sand.
7. „ coarse „

   Containing topaz, zircon, sapphire, tourmaline, quartz, spinelle, magnetite, titaniferous iron, garnet, gold, oxuiridium, &c.

8. Specimens of small pebbles as separated from the drift.
9. „ large „
10. Nodules of limonite, found in drift, set free from magnesite.
11. Graphite, from Ceylon.
12. Specimens of tin-stone, from New England, New South Wales.

Presented by Archibald Liversidge, Esq., F.C.S., F.G.S., Reader in Geology in the University of Sydney.

Additional specimens of New South Wales Alluvial Gold. (See pp. 60 to 63) :—

From Gulf, Moruya
„ Warner's Claim, Adelong
„ An Gin's Claim, Adelong
„ Reedy Flat, Adelong
„ Sydney Flat, Rocky River
„ Table-land, Timbarra
} Without strata.

„ Kiandra, 15½ oz. of gold crystals.

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CATALOGUE

OF THE

MINERALOGICAL COLLECTION

IN THE

AUSTRALIAN MUSEUM.

INTRODUCTION.

CHARACTER OF MINERALS.

Minerals are natural inorganic bodies, possessing definite chemical and physical qualities. About 600 different minerals are at present known; but many of these are of rare occurrence, and, though extremely interesting to science, are without economic import. Selecting those minerals which are remarkable for their wide distribution and at the same time those which are of value, whether rare or frequent, the number which it is advisable for practical miners to know is thus reduced to about seventy-five; this limited number only will be more fully described.

In distinguishing animals and plants we may be guided by conspicuous difference in form, size, and colour; but in the mineral world these characters are liable to so much variation that they often cease to be distinctive. And in the case of living things the structure of the various organs may differ, thus affording many points of comparison; whereas minerals are destitute of organs. All parts of a mineral are alike: the smallest fragment has similar properties to the whole.

3w 1—72

The distinctions in minerals lie in their chemical and physical characters; *but as the appearance of a mineral may afford little or no indication of what these are, they have to be discovered by testing.*

These characters will be described in detail, and the modes of testing will be indicated where necessary.

The characters include crystalline form, mode of fracture, colour, lustre, transparency, taste, odour, feel, hardness, specific gravity, fusibility, and chemical composition.

Crystalline Form.

The following primary and other forms will be found illustrated by models in the collection.

Cube.—6 sides or faces, each square.

Octahedron.—8 sides, each an equal-sided triangle.

Dodecahedron.—12 sides, each rhombic (shaped like the diamond of a pack of cards).

Tetrahedron.—4 sides, each triangular.

Rhombohedron.—6 sides, each rhombic.

Prism.—Any column with three or more sides; when placed on its base it may stand *straight* or *oblique;* it may terminate abruptly with a flat face; or come off to a point, blunt or sharp, like a pyramid.

The crystalline form is an important guide in many cases, but crystals are subject to so many modifications that this character ceases to be a practical one, except to those persons who are familiar with its geometrical laws.

Cleavage and Fracture.

The mode in which a mineral breaks when smartly struck with a hammer, or pressed with the point of a knife, is a character of importance. Many can only be broken in certain directions: for instance, a crystal of calc spar can only be split parallel to the faces of a rhombohedron; many crystals break more easily in one direction than in others. Whenever a mineral breaks with a smooth, flat, even surface, it is said to exhibit *cleavage.* Cleavage always depends upon the crystalline form. But minerals often break in irregular directions, having no

connection whatever with the crystalline form, and this kind of breaking is called *fracture;* the broken surfaces are usually irregular or conchoidal (*i.e.*, with concave and convex outlines, like shells).

Hardness and Tenacity.

This character is of great importance in distinguishing minerals; it implies the degree of facility with which the particles may be separated by cutting or scratching. The diamond is the hardest substance known, as it will scratch all others. Talc is one of the softest minerals. Other minerals possess intermediate degrees of hardness. To express how hard any mineral is, it becomes necessary to compare it with some known standard. Ten standards of different degrees have been chosen, and are given in order in the following scale :—

1. Talc.
2. Gypsum.
3. Calc Spar.
4. Fluor Spar.
5. Apatite.
6. Felspar.
7. Quartz.
8. Topaz.
9. Corundum, or Sapphire.
10. Diamond.

The hardness of a mineral may often be found by drawing the point of a steel knife across it. For instance, the slightest pressure will suffice to scratch talc; fluor spar is not so easily scratched as calcite; the greatest pressure is needed to scratch felspar; and quartz does not yield to the knife at all.

The hardness may also be found by scratching one mineral with another; thus, the diamond will scratch all other minerals; corundum scratches topaz; topaz scratches quartz; quartz scratches felspar; and so on.

If on drawing a knife across a mineral it is impressed as easily as calcite, its hardness is said to be 3. If a mineral scratches quartz, but is itself scratched by topaz, its hardness is between 7 and 8.

In trying the hardness of a mineral a little judgment is necessary; for instance, a sound portion of the mineral must be chosen; a sharp angle used in trying to scratch; a streak of dust on scratching one mineral with another may come from the waste of either, and it cannot be determined which is the softer, until after wiping off the dust, and

viewing with a lens. The use of the above scale, however, implies an acquaintance with the ten standard minerals. It is very desirable to have lustre, colour, and streak. Some minerals have a brilliant lustre like that of metals; in others the lustre resembles that of glass, or silk, or resin, or wax; while others are dull, or destitute of lustre. The lustre of the diamond is called adamantine.

Minerals may be colourless, white, black, or of any colour, either dull or brilliant. The same mineral may present a variety of similar tints, or even distinct colours. It often happens that a mineral which, when viewed in a solid mass possesses a distinct colour, affords a powder which has a colour different from that of the solid mass, or is even destitute of colour, that is to say, white or nearly so. The dust formed on scratching a mineral with a knife, or by a splinter of quartz, or by a diamond, is termed the "*streak*"; it has usually the same colour as the powder. The colour of a mineral and its streak may correspond; or the mineral and its streak may possess different colours; or the mineral may be coloured, while its streak is colourless.

For instance, cinnabar has both a red colour and a red streak.

Specular iron has a black colour, but a red streak.

Sapphire has a blue colour, but a white or colourless streak.

The streak of most minerals is dull, and pulverulent, but a few minerals exhibit a shining streak, like that formed on scratching a piece of lead or copper. This kind of streak is distinguished by the name of *metallic*.

In judging the colour of a mineral, a surface quite free from tarnish should be chosen.

The colour of a transparent gem can be seen to best advantage by immersing it in water, about half an inch below the surface.

Specific Gravity.

Specific gravity is the comparative weight of equal bulks. Water is taken as the standard of comparison; the specific gravity of a mineral is a number showing how many times it is, bulk for bulk, heavier than water.

Rule.—The specific gravity of water is called 1, of gold 19, implying that if equal bulks of gold and water were taken, the gold would weigh 19 times as heavy as the water. The specific gravity of a mineral can be found by weighing it first in air in the usual manner, and then observing how much of its weight it loses when suspended from the arm or pan of a balance, and allowed to hang freely in water. If a piece of quartz, weighing 26 grains, is attached by a hair or thin cotton to the scales—and weighed whilst hanging in water—it will be found to weigh only 16 grains; it thus loses 10 grains, or $\frac{10}{26}$ of its entire weight. Similarly gold would lose $\frac{1}{19}$ of its weight.

Minerals differ very widely in the proportion of weight which they lose in water, but the same mineral invariably loses the same proportion, for instance: Quartz loses $\frac{10}{26}$ of its weight; topaz, $\frac{10}{35}$; sapphire, $\frac{10}{40}$; zircon, $\frac{10}{45}$; tin ore, $\frac{10}{70}$.

These proportions depend upon the specific gravity of these minerals. The specific gravity of water is called 1, of quartz 2·6, of topaz 3·5, of sapphire 4·0, of gold 19; signifying, among other facts, that quartz loses $\frac{10}{26}$ of its weight in water; topaz, $\frac{10}{35}$; sapphire, $\frac{1}{4}$; gold, $\frac{1}{19}$.

In determining how much weight a mineral loses in water, a very delicate balance is required when the weight in air is under 10 grains; but for portions weighing heavier than this, a common balance, turning readily to a grain, may be used for practical purposes. The mineral must be sound throughout, and free from any pores, or cracks, and its surface should be rubbed over with water before immersing it, to prevent bubbles of air adhering, which would falsify the result. In careful trials rain water should be used. A trial of specific gravity can have no value unless it is made on a pure portion of a mineral, quite free from any adhering foreign matter.

A rough estimate of specific gravity can be formed from the feeling of pressure in shaking any mass loosely in the palm of the hand; in this way it can be judged whether the specific gravity is high or low.

Chemical Characters—Fusibility and use of the Blowpipe.

Some minerals can be easily fused; others only with difficulty; while others resist the highest heat which can be applied to them. There are such wide differences between the various degrees of fusibility of

minerals that this character helps greatly in distinguishing them. The fusibility is most readily tested by holding a small splinter of the mineral with a forceps, in a candle-flame, urged by the blowpipe; or the mineral may be laid upon a piece of charcoal, and the flame directed upon it by the blowpipe. Some minerals fly to pieces when heated, others swell up, or give off peculiar and characteristic odours.

The chemical composition of a mineral is one of the most important facts to know respecting it; the various processes for determining this form a science by themselves; but only two methods will be adopted here: First, tests depending upon the use of the blowpipe; secondly, the use of acids. A great deal can be learnt respecting a mineral by a few simple trials with the blowpipe. The only requirements are a common blowpipe, a candle, a forceps or pliers, a piece of No. 7 platinum wire, two inches long, dried carbonate of soda, dried borax, and cyanide of potassium. The charcoal selected for these experiments should be free from cracks and openings. By dry carbonate of soda is meant not merely dry to the touch, but quite free from water; this may be prepared from common washing soda, by expelling the water which it contains. The washing soda is put in a shallow clean iron dish, and placed over a clear fire until a white dry powder is formed; too strong a heat might fuse the dry powder. A quarter of an ounce may be kept in a well corked bottle or tube for use. Bicarbonate of soda may be used instead without previous heating; or if the bicarbonate be moderately heated, it loses weight, and becomes carbonate of soda, quite free from water, like the above.

The borax is to be dried in the same way; a quarter of an ounce will be enough. It is convenient to keep the platinum wire in the same tube. Unless these tubes are well corked, these chemicals reabsorb moisture. For testing tin ore it is useful to have a little cyanide of potassium, kept in a bottle, with the cork and rim well covered with melted beeswax; it would otherwise liquefy, by absorption of moisture, and becomes useless. It is a most dangerous poison, and the greatest caution must be observed in its use.

Use of the Blowpipe.—A description of the blowpipe and the mode of using it may be found in any work on Chemistry; a little practice is required before it can be used with certainty. The blowpipe should

have a fine jet, or aperture, wide enough to admit a fine needle. The beginner may readily acquire the mode of using it by first breathing through the nostrils, with the lips closed; then puffing out the cheeks (as if rinsing the mouth with water), still keeping the lips closed, and breathing as before. The blowpipe may at this point be slipped between the lips, and it will be found that a current of air escapes through it without any effort on the part of the operator. Air flows through the pipe owing to the tendency of the distended cheeks to collapse; it must never be forced from the lungs. After a little practice the strength of the current may be increased. By breathing entirely through the nostrils, keeping the lips closed, the blast may be kept up for ten minutes or longer without exhaustion or inconvenience, except a slight fatigue of the lips in holding the blowpipe. The flame of a common candle is one of the best to employ.

Three kinds of effect can be produced by the blowpipe: *First*, it can be used as a source of heat for testing fusibility—for this purpose it is well to know where to find the hottest part of the flame; *secondly*, it can add oxygen to a mineral; *thirdly*, it can take oxygen away. A knowledge of the structure of a candle-flame will facilitate the attainment of these objects.

A candle may be considered a gas manufactory on a small scale: once alight, the heat melts the wax, which ascends the wick, and finally becomes gas; the hot gas and the oxygen of the air combine together, or, as we say, burn. The dark, inner part of a candle-flame is where the gas is distilled from the wick; at the high temperature of the flame this combustible gas combines readily with oxygen gas; and it has also the power of depriving many solid substances of oxygen.

As the combustible gas spreads outwards from the central dark space, it meets with oxygen gas in the air, and its combustion becomes more and more perfect on approaching the surface. The luminous part is where the combustion is still imperfect. If a substance be held just above the apex of a flame, the current of air mechanically carried along by the flame strikes upon it, and under these circumstances many substances *absorb oxygen gas.*

If air is blown upon a flame the supply of oxygen is increased, the burning becomes more complete, and the heat is intensified. If, with the blowpipe, a steady current of air be directed horizontally through the flame, placing the jet within the flame's border, a little above the wick, which may be slightly bent down, two sharply-defined cones of flame will be thus produced; an inner blue cone, and an outer feebly luminous one. The *tip of the blue cone* is the *hottest* part of the flame, and it is here that a fragment of a mineral should be held in testing its fusibility. To add oxygen, or, as it is often termed, to *oxidize* or roast a mineral, it should be held at the very tip of the outer flame, where it may be kept in a strongly heated state, and allowed to absorb oxygen from the surrounding air to the full extent of its power.

Only a small portion of the blowpipe flame is suitable for the third purpose, to remove oxygen, or deoxidize, or *reduce.*

A mineral may be deprived of oxygen *(reduced)* by the combustible gas of the candle, but the only part of the blowpipe flame where this gas exists in an available form is in the outer cone, just in front of the inner blue cone.

The mineral to be deoxidized must be completely enveloped in this burning gas, for, if it projects beyond the flame, it absorbs oxygen from the air as fast as the combustible gas removes it.

For *deoxidizing*, or *reducing*, it is convenient to increase the size of the suitable part of the flame by blowing in a different manner. This may be done by removing the jet out of the flame, keeping it slightly above the level of the bent-down wick, and blowing gently so as to make the flame roar slightly, but without destroying its entire luminosity. The interior of this flame near its extremity will be found to possess strong reducing power.

The three principal means of chemically testing minerals before the blowpipe are, (1) with borax; (2) on charcoal, usually with the addition of carbonate of soda; (3) by holding in the oxidizing point.

Experiment No. 1.—Many metals impart a colour to fused borax, by which their presence can be recognized. To try this experiment, a bead of fused borax must first be obtained on the platinum wire. The end

of the wire is bent into a loop or ring, about the twelfth part of an inch in diameter. The wire is then heated in the blowpipe flame, and dipped whilst hot into the borax; the portion of borax that adheres is then fused on to the wire in the blowpipe flame, and the hot wire is again dipped; this is repeated until the loop contains a glass-like bead of fused borax. If the bead has become cloudy, the soot causing this may be burnt off in the oxidizing point of the flame. Having thus obtained a clear, colourless, transparent bead, the next step is to add to it a minute portion of the mineral which is to be tested. By touching a little of the finely pulverized mineral with the borax bead, while softened by heat, enough will adhere to the bead for a first trial. The bead is then kept at a white heat in the oxidizing point of the flame for a few seconds, and on removal its colour is noted, both whilst hot and when cold. If no colour is imparted a fresh trial may be made with a larger quantity of the powder; but if the bead is opaque, owing to the depth of colour, as is often the case, a fresh experiment must be made, using a still smaller quantity of the powder. The colour can only be fairly judged in a perfectly transparent bead. If no colour can be obtained in the oxidizing point, further experiment with the borax bead is needless; but if a colour is obtained, it is then advisable to try the effect of the reducing flame upon the same bead. The following observations and inferences may result from this test:—

Colour of Bead in—

Oxidizing.	Reducing.	Presence of—
Green (hot); Blue (cold)	Red	Copper.
Blue (hot and cold)	Blue	Cobalt.
Amethyst	Colourless	Manganese.
Green	Green	Chromium.
Red or Yellow (hot) Yellow or colourless (cold)	Bottle-green	Iron.
Violet (hot); Red-brown (cold)	Grey and Turbid; difficult to obtain.	Nickel.

This mode of testing may often be used to prove the presence of the above-mentioned metals.

It requires some practice before reliable results can be obtained in reducing. The reduced bead, if brought out of the flame at a white heat into the air, may at once oxidize; but this may be prevented by placing it inside the dark inner cone of an ordinary candle flame, and allowing it to cool partially there.

Experiment No. 2.—The mode of testing with carbonate of soda on charcoal is performed as follows:—A sound piece of charcoal, half an inch square, is chosen, and a neat cavity is scooped out on its surface, into which is placed a mixture containing the pulverized mineral to be tested, with three or four parts of carbonate of soda, the whole not exceeding the bulk of a pea. After lightly pressing the mixture into the cavity, the blowpipe flame may be cautiously applied to it; and afterwards, when the mixture no longer shows a tendency to fly off, the charcoal may be advanced nearer to the blow-pipe, and finally be kept at as high a temperature as possible in the reducing part of the flame.

In testing for tin ore a piece of cyanide of potassium, about the size of a pea, may be placed upon the mixture after the first application of heat, and the further application of heat may then be continued.

This treatment is designed to extract metals from minerals; it favours in the highest degree the removal of oxygen. But, like the borax test, it is limited in its application—it can only be used to detect certain metals. The failure of the test, in any case, must not be looked upon as a conclusive proof of the absence of the particular metal sought; for instance, copper can be easily abstracted from carbonate of copper by this test, but not from copper pyrites. Still the test is a most valuable and indispensable one to the mineralogist. The test is complete when the metal is obtained as a globule in the cavity of the charcoal. In many cases the globule will be found surrounded with the oxide of the metal, forming an incrustation on the charcoal; and the colour of such incrustation should be carefully noted, both at the moment of removal from the flame and after cooling. By pressing the globule between smooth and hard surfaces it can be determined whether the metal is flattened out (or malleable) or crushed to pieces (brittle).

The following observations and inferences may result from this test:—

Globule.	Incrustation.	Presence of—
Yellow malleable...	None	Gold.
White do.	Do.	Silver.
Red do.	Do.	Copper.
White do.	White	Tin.
Do. do.	Red (hot); Yellow (cold) ...	Lead.
Do. brittle	Do. do. ...	Bismuth.
None	Yellow (hot); White (cold)...	Zinc.
White, brittle, giving off fumes when removed from the flame.	White	Antimony.

Experiment No. 3.—In addition to these substances there are others which occur abundantly in minerals, and which may be recognized by the blowpipe with the greatest ease. For instance, sulphur and arsenic. These may be discovered by heating a fragment of the mineral, supported on a piece of charcoal, or held in a forceps, in the oxidizing point of the flame, and comparing the odour which is given off; a smell of burning sulphur indicates that the mineral contains that substance, and white fumes, having a garlic odour, indicate the presence of arsenic.

Mercury, antimony, and other substances may escape as fumes when heated in this manner.

Use of Acids.—In some instances it is useful to try the effect of nitric acid upon a mineral. For this purpose the mineral should be finely powdered, and a small quantity, taken on the point of a penknife, may be put in a suitable vessel, and covered with nitric acid. The trial is most conveniently made in a glass tube, sealed at one end, commonly called a test tube, as this may safely be boiled over a candle flame; but other contrivances may be adopted if a test tube is not at hand.

Requirements for testing minerals.

The requirements already mentioned are blowpipe, candle, forceps, platinum wire, dried borax, dried carbonate of soda, cyanide of potassium, charcoal; also the minerals for comparisons of hardness, namely, calcspar, felspar, quartz, topaz, sapphire. In travelling it is well to dispense with the grain scales and weights for taking specific gravities. It would be dangerous to attempt to travel with nitric acid. In addition

to these, it will be found useful to have a steel pocket-knife, one blade of which should be kept magnetized, which may be easily done by touching it occasionally with a strong magnet; a small iron spoon for heating minerals, such as cinnabar, over a candle flame; also a small pocket lens.*

Useful Metals and Metallic Ores.

(*From Danas' Mineralogy, pages* 514, 515, *and* 516.)

Gold.—Native Gold, distinguished from all minerals it resembles by its flattening under a hammer, its cutting like lead, although considerably harder, its resisting the action of nitric acid, hot or cold, and its high specific gravity.

Platinum, Iridium, Palladium.—Native Platinum, the source of the platinum of commerce, is distinguished by the same tests as gold, and it is mainly on account of its malleability that it occurs in flattened grains or scales. Platiniridium is another ore, somewhat harder. Iridosmine resembles platinum, but it scratches glass, and gives the reaction of osmium, besides being rather brittle.

Silver.—The important silver ores are native silver, sectile and malleable like gold; the only one that has a white colour. Silver glance, or *sulphide of silver*, blackish lead-gray, cutting (unlike the following) nearly like pure lead, cubic in crystallization. Pyrargyrite and proustite, or *ruby silver ore*, ruby red to black, always giving a bright red powder. Freislebenite, or *gray silver ore*, steel-gray, rather brittle, and powder steel-gray. Stephanite, or *brittle* or *black silver ore*, iron-black, and giving an iron-black powder. Kerargyrite, or *horn silver*, resembling a dark-coloured gray or greenish wax, and cutting like wax. Embolite, or *chloro-bromide of silver*, like the last, but more greenish. These ores yield silver easily when heated on charcoal. Besides these, tetrahedrite, or *gray copper*, is often a

* The above remarks are by the late Professor Alexander M. Thomson, who returned this Catalogue, which had been submitted to him by the compiler, a few days before his death, adding these notes from his pamphlet for the instruction of miners and explorers.

valuable silver ore. Galena, although seldom yielding more than 74 ounces to the ton, affords a considerable part of the silver of commerce. There are also other rarer silver ores.

Copper.—The more valuable species are, native copper, chalcopyrite, or *copper pyrites*, of a brass yellow colour, scratched easily with the point of a knife-blade, and giving a greenish-black powder. Barnardite and Cuban, which are similar to the last, but paler. Erubescite or *purple copper*, pale yellowish, with a slight coppery tinge, but tarnishing externally to purple, blue and reddish tints; easily scratched with a knife-blade, and powder grayish. Copper glance, or *vitreous copper*, of a dark lead-gray colour, and powder similar; resembling some silver ores, but yielding copper and not silver when heated on charcoal. Tetrahedrite, or *gray copper*, of a somewhat paler steel-gray colour and powder. Red copper, black copper, malachite, or *green carbonate of copper*, of a bright green colour, sometimes earthy in the fracture, and sometimes silky. Azurite, or *blue malachite*, of a rich deep blue colour, either earthy or vitreous in lustre.—(All the above are acted on by nitric acid, and the solution deposits a red coating of copper on a strip of polished iron.) Chrysocolla, or *silicate of copper*, resembling the green carbonate, but paler green, and usually having a close texture (never fibrous), a smoother surface, and somewhat waxy lustre, although occurring usually only as an incrustation. Atacamite, or *chloride of copper*, of deeper green than malachite. Sulphate of copper in solution.*

Quicksilver or Mercury.—The only valuable ore is cinnabar, of a bright red to brownish-black colour, with always a red powder, and affording fumes of quicksilver when heated on charcoal. There are also *native quicksilver*, *amalgam*, *selenide*, *chloride*, and *iodide*. Tetrahedrite sometimes contains this metal.

Lead.—Galena is the only abundant lead ore; it is a lead-gray brittle ore, yielding lead when heated with charcoal. There are many other ores of this metal, consisting of *selenides*, *vanadiates*, *tungstates*,

* All the rarer ores not mentioned here will be found in the collection.

chromates, *sulphates* (of which *anglesite* is the common one), *phosphates*, *arsenates*, *molybdates*, *&c.*

Zinc.—The most important ores are: Smithsonite, or *carbonate of zinc;* Calamine, or *silicate of zinc.* They are alike in a white, grayish-white, or greenish-white colour, commonly a slight waxy lustre and smooth look (often stalactitic or mammillary), yet sometimes earthy, and a hardness such that the surface is scratched with a knife-blade with some little difficulty. They differ in their action with hydrochloric acid; when the surface is drusy, the silicate shows projections of minute rectangular prisms. Zincite, or *red zinc ore*, is also important; it is a bright red, and very distinctly foliated. Blende, or *sulphide of zinc*, is a common ore, having a yellow to black colour and resinous lustre, and distinctly cleavable; the black varieties are sometimes a little metallic in lustre, but the powder is nearly or quite white. The other ores of zinc are *sulphates*, *phosphates*, *arsenates*, *&c.*

Cobalt, Nickel.—The ores of cobalt of first importance are smaltine and cobaltine, both of nearly a tin-white colour, with the powder greyish-black colour, sometimes verging slightly to gray. The *black oxide of cobalt*, a kind of bog ore, and very impure, is sometimes sufficiently abundant to be valuable. The useful ores of nickel are: Chloanthite, or the *nickeliferous smaltine;* Gersdorffite, or *nickel glance;* and copper nickel; the latter distinguished by a pale copper-red colour. The other ores of cobalt are *sulphides*, *arsenides*, *sulphates*, *arsenates*, *carbonates*, *&c.;* of nickel, *sulphides*, *arsenides*, *silicates*, *sulphates*, *arsenates*, *carbonates*, *&c.*

Manganese.—Common, as pyrolusite and psilomelane, both black or grayish-black ores, and having little lustre, and a blackish streak or powder, in which last particular they are distinct from the iron ore called limonite, with which they are often associated, and also from hematite, or specular iron. Wad is an earthy bog manganese, sometimes abundant and valuable. Manganite is abundant in certain mines, but is of little value in the arts, because of its containing so little oxygen (one-third less than pyrolusite), to which fact Beau-

dant alludes in his name for the species, acerdese; it differs from pyrolusite in its reddish-brown powder. The other manganese ores are *sulphides, arsenides, oxides, silicates, phosphates, carbonates, &c.*

Chromium.—Chromic iron, a grayish-black, little lustrous ore, occurring mostly in serpentine, is the source of chrome in the arts. The chrome ores are *chromates.*

Iron.—The important ores are: Hematite, or *specular iron* (the *bloodstone* of Theophrastus), characterized by its blood-red powder, and occurring either earthy and red, or metallic and dark steel-gray; in the latter condition very hard, a knife-point making no impression. Magnetite, or *magnetic iron ore*, as hard as the preceding, but having a black powder, and being attractable by a magnet. Limonite, called also *brown hematite*, a softer hydrous ore, affording a brownish-yellow powder; earthy or semi-metallic in appearance, and often in mammillary or stalactitic forms. Chalybite, or *spathic iron*, a sparry ore, of grayish, grayish-brown, and brown colours, very distinctly cleavable, turning brown to black on exposure. The common clayey iron ores are impure ores, either of *spathic iron*, *limonite*, or *hematite;* when the last, they are red; when brown, reddish-brown, or yellowish-brown to black, they may be either of the two former. One of the most common ores of iron is pyrites, or *sulphide of iron*, a pale yellow brass-like ore, hard enough to strike fire with steel, and thus unlike any copper ore, and all similar ores of other metals. Marcasite is similar, but is prismatic, and often crested in its forms. Pyrrhotine, or *magnetic pyrites*, is less hard, and paler, or more grayish in colour. Leucopirite and mispickel are white metallic arsenical ores, somewhat resembling ores of cobalt. Ilmenite, or *titanic iron*, resembles specular iron closely, but has not a red powder; it is abundant in some regions. The other ores of iron are *arsenates, sulphates, oxalates, phosphates, &c.*

Tin.—The only valuable ore is cassiterite, or the *oxide of tin*, a very hard mineral, of a dark brown to black colour, sometimes gray or grayish-brown, without any metallic appearance. The crystals usually

have a very brilliant lustre. Tin also occurs as a *sulphide*, and is sparingly found in ores of *tantalum*, and some other mineral species.

Titanium.—The only ore of this metal of any value is rutile.

Arsenic.—Native arsenic is too rare to be of much avail. Orpiment, a sulphur-yellow foliaceous and somewhat pearly mineral; and realgar, bright red and vitreous. Arsenic is mostly derived for the arts from the arsenical ores of *iron*, *cobalt*, and *nickel*.

Antimony.—Stibnite, or *gray antimony*, is the source of the antimony of commerce. It is a lead-gray ore, usually fibrous or in prismatic crystals, and distinguished from a similar ore of manganese by its perfect diagonal cleavage and its easy fusibility. Antimony occurs also in numerous ores of *lead* and *silver*, of *nickel*, and also as *oxides*.

Bismuth.—Native bismuth, the source of the metal in the arts, is whitish, with a faint reddish tinge, has a perfect cleavage, and is very fusible. Other bismuth ores are: the oxides, a silicate, and a carbonate.

EXAMPLES OF MINERALS.

Part I.

QUARTZ AND THE SILICATES.

Perhaps no other mineral presents such a great variety of forms and colours as quartz, and no mineral occurs in greater abundance. When pure it consists of silica only, but it is usually contaminated with other ingredients, principally alumina, iron, and clay. The impure varieties of quartz compose most of the pebbles and sand of the soil.

Out of the six hundred minerals at present known, at least two hundred and fifty contain silica in greater or less proportions, and are hence termed *silicates.*

Silicates are indispensable in the manufacture of glass, porcelain, earthenware, and for other purposes; but they exist in such profusion that their economic value is exceedingly trifling. The great majority of the silicates are purely objects of scientific interest; a few are esteemed as gems, such as the precious opal, some varieties of quartz, the topaz, the emerald, the zircon or hyacinth, the garnet and carbuncle, the tourmaline, and some others. Handsome varieties of serpentine are often used in ornamental stone-work.

DIVISION I.

QUARTZ—and its varieties.

Chemical Composition—Silica.

Crystallized in six-sided prisms, terminated by pyramids. Sides of the crystal often marked across with fine parallel lines. Transparent or opaque. Colourless or of various colours. Glassy lustre. Fracture irregular, conchoidal. Specific gravity, 2·6. Hardness, 7. Cannot be scratched with a knife; scratched by topaz, zircon, sapphire, and diamond, and thus easily distinguished from these gems. Quartz scratches glass with facility; feldspar and many other minerals can be scratched by quartz. The irregular fracture, the fine parallel markings, and the hardness generally, suffice to distinguish quartz.

Infusible in the *blow-pipe flame.*

The following are the chief varieties of quartz; the differences are due either to their mode of formation or the presence of impurities. They have the same general characters as pure quartz:—

1. *Transparent varieties:—*
   - Rock crystal.—Pure, transparent, colourless quartz. Used for spectacle-glasses and ornament.
   - Amethyst.—Transparent. Of a rich violet or purple colour. Used as a gem.
   - Rose quartz.—Seldom perfectly transparent. Of a rosy tint.
   - Cairngorm or smoky quartz is transparent, with a smoky tinge.
   - False topaz has a yellow pellucid colour, distinguished from topaz and oriental topaz by its inferior hardness.
2. *Semi-transparent varieties:—*
   - Chalcedony.—Pale colour and waxy lustre. Resembling icicles in some instances; the frothy surface of a liquid in others.
   - Carnelian and sard have red tints.
   - Agate exhibits cloudy or moss-like patches, or a number of lines arranged in circular and angular patterns.
   - Onyx or sardonyx is made up of regular layers, one above another, of different colours, often white and red. It is much used for cameos.
   - Flint or hornstone.—Common dull varieties.
3. *Opaque varieties:—*
   - Jasper is quartz rendered opaque by clay, iron, and other impurities; it is of a red, yellow, or green colour; sometimes the colours are arranged in ribands, or in other fantastic forms. It is used for ornamental work.
   - Bloodstone is green jasper, with splashes of red resembling blood spots.

1. **Rock Crystal**—St. Gotthard, Switzerland.
2. **Rock Crystal**—Oisans, Dauphiné, France.
3. **Rock Crystal**—*Smoky Quartz*—Grisons, Switzerland.
4. **Rock Crystal**—*Modified Crystals with Brownspar*—Traversella, Piedmont, Italy.
5. **Rock Crystal**—Grisons, Switzerland.
6. **Rock Crystal**—Huasco, Chili.
7. **Rock Crystal**—*In Calcite*—Dauphiné, France.
8. **Rock Crystal**—St. Gotthard, Switzerland.
9. **Rock Crystal**—*On Marble*—Carrara, Italy.
10. **Rock Crystal and Specular Iron**—Whitehaven, Cumberland, England.
11. **Rock Crystal and Calorite on Fluorspar**—Alston, Cumberland, England.

12. **Quartz**—Lauterberg, Hartz, GERMANY.
13. **Quartz and Pearlspar**—Freiberg, Saxony, GERMANY.
14. **Amethyst**—A variety of Quartz-crystal. The colour is supposed to be due to a small percentage of Oxide of Manganese; others consider the colour owing to a compound of Iron and Soda.—BRAZIL.
15. **Amethyst**—Lake Baikal, Siberia, RUSSIA.
16. **Amethyst**—Uruguay, SOUTH AMERICA.
17. **Amethyst**—Uruguay, SOUTH AMERICA.
18. **Amethyst**—Halsbach, near Freiberg, SAXONY.
19. **Quartz**—*Rose Quartz*—The colour is attributed to Oxide of Titanium—Zwiesel, Bavaria, GERMANY.
20. **Quartz**—Marienberg, Saxony, GERMANY.
21. **Quartz or Massive Quartz**—Schneeberg, Saxony, GERMANY.
22. **Quartz**—Elba, ITALY.
23. **Quartz**—*On Hematite*—Whitehaven, Cumberland, ENGLAND.
24. **Quartz**—Alston, Cumberland, ENGLAND.
25. **Quartz**—*Cast on Fluorspar-cubes*—Alston, Cumberland, ENGLAND.
26. **Quartz and Pyrites**—Oberstein, Palatinate, GERMANY.
27. **Quartz**—Nassau, GERMANY.
28. **Quartz**—*Cats'-eye variety*—Wallis, SWITZERLAND.
29. **Quartz or Prasein**—Breitenbrunn, Saxony, GERMANY.
30. **Quartz**—*Blue variety*—Golling, Styria, AUSTRIA.
31. **Quartz**—*Ferruginous variety*—Steinbach, Saxony, GERMANY.
32. **Quartz**—*Ferruginous variety*—Iserlohn, Westphalia, GERMANY.
33. **Quartz**—*Geode*—Ural Mountains, RUSSIA.
34. **Quartz**—Breitenbrunn, Saxony, GERMANY.
35. **Quartz**—*Polished and Banded variety*—Freiberg, Saxony, GERMANY.
36. **Quartz**—*Polished, on Barytine*—Przibram, Bohemia, AUSTRIA.
37. **Quartz**—Schneeberg, Saxony, GERMANY.
38. **Quartz**—*Or Hornstone; pseudomorphous*—Schneeberg, Saxony, GERMANY.
39. **Jasper**—EGYPT.
40. **Jasper**—Liehl, Baden, GERMANY.
41. **Jasper**—Kandern, Baden, GERMANY.
42. **Jasper**—*Ferruginous variety*—Langenberg, Saxony, GERMANY.
43. **Jasper**—*Bloodstone*—Sicily, ITALY.
44. **Jasper**—*Heliotrope*—Uruguay, SOUTH AMERICA.
45. **Jasper**—*Banded*—Kohren, Saxony, GERMANY.
46. **Jasper**—*Green Banded*—Ural Mountains, RUSSIA.
47. **Jasper**—*Banded*—Lerbach, Hartz Mountains, GERMANY.

48. Jasper—*Yellow*—Aarau, Switzerland.
49. Jasper—*Porcellanite*—Teplitz, Bohemia, Austria.
50. Jasper—*Porcellanite*—Teplitz, Bohemia, Austria.
51. Jasper—*Banded Porcellanite*—Teplitz, Bohemia, Austria.
52. Silex or Hornstone—Wurtzen, Saxony, Germany.
53. Silex or Hornstone—Spitzleite, Saxony, Germany.
54. Silex or Hornstone—Fahlun, Norway.
55. Silex or Hornstone—Johann-Georgenstadt, Saxony, Germany.
56. Silex or Hornstone—Meissen, Saxony, Germany.
57. Silex or Hornstone—Champigny, Seine and Oise, France.
58. Chalcedony—Iceland, Danish Province.
59. Chalcedony and Quartz—Uruguay, South America.
60. Chalcedony—Wagnon, Ardennes, France.
61. Chalcedony—Point-du-Château, Auvergne, France.
62. Chalcedony—*Onyx*—Uruguay, South America.
63. Chalcedony—Champlitte, Hte. Saône, France.
64. Chalcedony and Opal—Steinheim, Hesse, Germany.
65. Plasma—*A faintly translucent Chalcedony*—Mount Hauskopf, near Oppenau, Baden, Germany.
66. Chalcedony—*Chrysoprase*—Frankenstein, Silesia, Prussia, Germany.
67. Chalcedony—*Cornaline*—Freiberg, Saxony, Germany.
68. Agate—Saxony, Germany.
69. Agate—Saxony, Germany.
70. Agate—Vosges, France and Germany.
71. Agate—Oberstein, Palatinate, Germany.
72. Agate—Uruguay, South America.
73. Agate—Ural Mountains, Russia.
74. Agate—Uruguay, South America.
75. Agate—*To show the direction of infiltration*—Uruguay, South America.
76. Agate—Uruguay, South America.

OPAL.

Chemical Composition—Silica and Water.

Never crystallized. Fracture conchoidal. Specific gravity, 2·2. Hardness, 6. Can be scratched by Quartz, and thus distinguished from it.

Infusible. It is generally milk white.

Precious or Noble Opal exhibits a beautiful display of colours, and is a valuable and rare gem. The common varieties are of no value.

77. Precious Opal—Grenvenitza, Hungary.
78. Hyalite or Opal—Biella, Piedmont, Italy.

79. Hyalite or Opal—Isle of Arran.
80. Hyalite or Opal—Hanau, Hesse, Germany.
81. Hyalite or Opal—Kosemitz, Bohemia, Austria.
82. Hyalite or Opal—Bilin, Bohemia, Austria.
83. Hyalite or Opal—Puy de Rilly, near Issoire, France.
84. Hyalite or Opal—Sibethen, Hungary, Austria.
85. Hyalite or Opal—Bonn, Germany.
86. Hyalite or Opal—Saxony, Germany.
87. Hyalite or Opal—Teplitz, Bohemia, Germany.
88. Hyalite or Opal—France.
89. Hyalite or Opal—Istadt, Thuringia, Germany.
90. Hyalite or Opal—Kostenblatt, Bohemia.
91. Hyalite or Opal—*With Quincite*—Quincy, Cher., France.
92. Hyalite or Opal—Habichtswald, Hesse, Germany.
93. Hyalite Menilite or Opal—Paris, France.
94. Hyalite Menilite or Opal—Paris, France.
95. Hyalite Menilite or Opal—Paris, France.
96. Opal or Wood Opal—Siebengebirge, on the Rhine, Germany.
97. Geyserite or Silicious Tuffa—Iceland, Danish Province.
98. Hyalite or Opal—*In altered rock*—Solfatare de Pouzzoli, Italy.
99. Hyalite or Opal—*In Dolorite*—Schemnitz, Hungary, Austria.
100. Hyalite or Opal—*In Grauwacke*—Steinheim, Hesse, Germany.
101. Hyalite on Dolorite—*On Dolorite*—Kaiserstuhl, Baden, Germany.
102. Tripoli—Salzhausen, Hesse, Germany.
103. Tripoli—Oran, Algeria, Africa.
104. Tripoli—Menot, Auvergne, France.

DIVISION II.

CORUNDUM or SAPPHIRE.

Chemical Composition—Alumina.

In six-sided prisms, often irregularly shaped. Sometimes in granular masses. Transparent or opaque. Blue, black; also red, green, yellow, white. Glassy lustre; sometimes pearly. Fracture uneven or conchoidal. Specific gravity, 3·9 to 4·2. Hardness, 9. Easily scratches Topaz and Quartz. In hardness it is only inferior to the Diamond. Infusible.

Occurs in river sands; in Granite, Feldspar, Magnetic Iron, Basalt. As a gem it stands next in value to the Diamond, but its tint must be brilliant and clear. The blue variety is called *Sapphire*, the most esteemed shade being deep velvet blue; the blood-red variety is the *Oriental Ruby*, which can be easily distinguished from other red gems by its superior hardness; the bright yellow variety is the *Oriental Topas*, distinguished by its hardness from the Topaz, Yellow Tourmaline, and False Topaz; the bright green is the *Oriental Emerald;* the bright violet, *Oriental Amethyst;* these varieties readily scratch the Emerald and Amethyst; one variety exhibits a six-rayed star inside the prism, and it is called the *Asterias*. Dull crystals are called *Corundum*, and grey or black granular varieties, *Emery;* these two kinds are used for polishing powder. Ruby is the most highly prized form of this Mineral.

105. **Corundum or Sapphire**—Ceylon.
106. **Corundum or Sapphire**—Newton, New Jersey, U.S.
107. **Corundum**—*In Protogyne*—Mont Blanc, Switzerland.
108. **Corundum**—*Ruby with Clintonite, Amphibole, &c.*—Warwick, New York, U.S.
109. **Corundum**—Biella, Piedmont, Italy.
110. **Corundum**—Pennsylvania, U.S.
111. **Corundum**—*Emery*—Schwarzenberg, Saxony, Germany.
112. **Diaspore and Chloritoide**—Katherinenburg, Ural, Russia.

DIVISION III.

SILICATES.

BERYL or EMERALD.

Chemical Composition—Silica, Alumina, Glucina.

In six-sided prisms. Usually green. Transparent or opaque. Glassy lustre. Fracture uneven. Specific gravity, 2·7. Hardness, 7 to 8. Scratches Quartz.

Infusible, or nearly so, but becomes clouded by heating.

Occurs in Granite and Schist. Valuable for Jewellery when transparent and rich grass green (emerald), or sea green (aqua-marine). Opaque crystals of large size, exceeding a ton in weight, have been found in North America.

113. **Emerald**—*In Mica-slate*—Takawaja, Ural Mountains, Russia.
114. **Emerald**—Odontchelon, Siberia, Russia.
115. **Beryl or Emerald**—*In Pegmatite*—Royalston, Massachusetts, U.S.
116. **Beryl or Emerald, or Aquamarine**—Odontchelon, Siberia.
117. **Beryl or Emerald**—Limoges, France.
118. **Beryl or Emerald**—Limoges, France.

CHRYSOBERYL.

Chemical Composition—Alumina, Glucina.

In prisms or tables. Transparent or semi-transparent. Green. Lustre glassy. Fracture conchoidal; imperfect cleavage. Specific gravity, 3·5 to 3·8. Hardness, 8·5.

Infusible and unaltered before the blow-pipe.

Distinguished from Beryl by its specific gravity, its tabular crystallization, and its entire infusibility.

Occurs with Beryl in river sand, Gneiss, and Granite. Pellucid and fine opalescent varieties are used as gems.

119. **Chrysoberyl**—Brazil.

120. **Chrysoberyl**—Haddam, Connecticut, U.S.

121. **Phenakit or Phenacite**—Takawaja, Ural, Russia.

ZIRCON OR HYACINTH.

Chemical Composition—Silica, Zirconia.

In square prisms, terminated by pyramids, and in octahedrons. Often found in pebbles and grains. Transparent or opaque. Wine or brownish red, grey, yellow, white. Glassy lustre. Fracture usually irregular, but in one direction it can be split so as to exhibit a smooth even cleavage face having an adamantine lustre like the Diamond. Specific gravity, 4·0 to 5·0. Hardness, 7·5. Scratches Quartz; is scratched by Topaz.

Infusible; the red varieties, when heated before the blow-pipe, emit a bluish phosphorescent light, and become permanently colourless.

Occurs in Syenite, Granite, Basalt. Clear crystals used in jewellery, in jewelling watches, and imitation of Diamond. It may be distinguished from Diamond by its inferior hardness, and in not becoming so readily electric by friction.

122. **Zircon**—*With Elaeslite, Orthose, Fluorspar, &c.*—Brevig, Norway.

123. **Zircon**—Fredrikston, Norway.

124. **Zircon**—Henderson County, North Carolina, U.S.

125. **Disthene, Cyanite, or Kyanite**—*With Staurotide in Margarodite*—St. Gotthard, Switzerland.

126. **Disthene, Cyanite, or Kyanite**—Providence, Rhode Island, U.S.

127. **Disthene, Cyanite, or Kyanite**—Litchfield, Connecticut, U.S.

128. **Disthene, Cyanite, or Kyanite**—*With Quartz*—Zillerthal, Tyrol, Austria.

129. **Disthene, Cyanite, or Kyanite**—Leiperville, Pennsylvania, U.S.

130. **Disthene or Rhœticite**—Tyrol, Austria.

131. **Andalusite**—*With Quartz Mica*—Lisenz, Tyrol, Austria.
132. **Andalusite**—Delaware County, Pennsylvania, U.S.
133. **Andalusite**—*With Feldspath*—Braunsdorf, Saxony, Germany.
134. **Isopyre**—St. Just, France.
135. **Macle or Chiastolite**—*Variety of Andalusite*—Bretagne, France.
136. **Staurotide or Staurolith**—St. Gotthard, Switzerland.
137. **Staurotide or Staurolith**—*In Mica Slate*—Pyrenees, Spain.
138. **Fibrolite or Sillimanite**—Pfitsch, Tyrol, Austria.
139. **Bamlite or Kyanite**—*With Chlorite, Mica, and Quartz*—Brevig, Norway.

TOPAZ.

Chemical Composition—Silica, Alumina, Fluorine.

In prisms, sometimes furrowed lengthwise, variously terminated, breaking easily across with smooth brilliant cleavage. Transparent or semi-transparent. White, yellow, greenish, bluish, pink. Glassy lustre. Specific gravity, 3·5. Hardness, 8. Scratches Quartz. Is scratched by Sapphire.

Infusible, but often blistered and altered in colour by heat. When smooth surfaces are rubbed on cloth, they become strongly electric, and can attract small pieces of paper, but rough surfaces do not show this. The brilliant cleavage of Topaz distinguishes it from Tourmaline and other Minerals.

Occurs in Granite. Used in jewellery. (The Topaz becomes electric by friction much easier than other gems, such as the Balas Ruby, which it may resemble. The white Topaz resembles the Diamond; but, unlike Diamond, it can be scratched by Sapphire.)

140. **Topaz**—Schneckenstein, Saxony, Germany.
141. **Topaz**—Brazil, South America.
142. **Topaz**—Odontchelon, Siberia, Russia.
143. **Pycnite or Cylindrical Topaz**—*With Quartz and Mica*—Altenburg, Saxony, Germany.
144. **Axinite**—Oisans, Dauphiné, France.
145. **Axinite**—Thurn, Saxony, Germany.

TOURMALINE.

Chemical Composition—Silica, Alumina, Magnesia, Boracic Acid, Fluorine, Oxides of Iron (Lime and Alkalies).

In prisms, with three, six, nine, or more sides, furrowed lengthwise, terminating in low pyramids. Commonly black and opaque; rarely transparent, and of a rich red, yellow, or green colour. Glassy lustre. Fracture uneven. Specific gravity, 3·1. Hardness, 7 to 8. Cannot be scratched with a knife. Not scratched by Quartz.

Infusible.

When the smooth side of a prism is rubbed on cloth it becomes electric, and can attract a small piece of paper; if the prism is as wide as a pipe-stem,

when one side is heated for a moment in the blow-pipe flame the opposite side becomes electric, and can attract paper until the heat spreads uniformly through the crystal. (On this account Tourmaline is said to be *pyro-electric*.)

Occurs in Granite and Slate. Of no value; except the fine coloured transparent varieties, which are used as gems and for optical purposes.

146. **Tourmaline or Rubellite**—*With Quartz*—Roczena, Moravia, AUSTRIA.

147. **Tourmaline**—*With Mica*—Wallis, SWITZERLAND.

148. **Tourmaline**—*With Quartz*—Helsingfors, Finland, RUSSIA.

149. **Tourmaline**—*With Quartz and Feldspar*—Litchfield, Massachusetts, U.S.

150. **Tourmaline**—Hartz, GERMANY.

151. **Tourmaline, in flattened Crystals**—*With Mica*—Hamburg, New Jersey, U.S.

152. **Tourmaline**—*With Chlorite Slate*—Pfitsch, Tyrol, AUSTRIA.

153. **Tourmaline**—Clermont, Auvergne, FRANCE.

154. **Datolithe or Borate of Lime**—*On Diorite*—Bergenhill, New Jersey, U.S.

155. **Datolithe or Botryolite**—Arendal, NORWAY.

156. **Titanite or Sphene**—*With Chlorite and Quartz*—St. Gotthard, SWITZERLAND.

157. **Titanite or Sphene**—*With Adularia and Byssolite*—Pfitsch, Tyrol, AUSTRIA.

158. **Titanite, Sphene, or Ligurite**—*In Amphibolite*—Ala, Piedmont, ITALY.

159. **Titanite**—*Brown variety, with Pyroxene and Calcite*—Warwick, New York, U.S.

160. **Titanite**—*Brown variety, with Pyroxene, Graphite, and Feldspar*—Roger's Rock, New England, U.S.

161. **Titanite**—*Brown variety, with Elæolite, Scapolite, and Epidote*—Arendal, NORWAY.

162. **Titanite or Greenoughite**—*With Manganesian Epidote*—St. Marcel, Piedmont, ITALY.

163. **Peridot or Olivine or Chrysolite**—Eifel, Rhine Province, GERMANY.

164. **Chrysolite or Hyalosiderite**—Sasbach, Kaiserstuhl, GERMANY.

165. **Chondrodite, Brucite, or Maclurite**—*With Lime*—Orange County, New York, U.S.

166. **Chondrodite, Brucite, or Maclurite**—*Spinellane and Lime*—Warwick, New York, U.S.

167. **Humite**—*With Icespar and Idocrase*—Mount Somma, Vesuvius, ITALY.

168. **Jolite, Cordierite, or Dichroite**—Origerfoi, Finland, RUSSIA.

169. **Aspasiolite and Quartz**—Brevig, NORWAY.

170. **Praseolite and Quartz**—Brevig, Norway.

171. **Pyrargillite in Granite**—Helsingfors, Finland, Russia.

172. **Pinite**—St. Pardoux, Auvergne, France.

173. **Humboldite or Datholite**—Monte Somma, Vesuvius, Italy.

SPINEL OR SPINELLANE.

Chemical Composition.—Alumina, Magnesia.

In Octahedrons, occurring only crystallized. Usually red and transparent; also white, blue, green, yellow, brown, black; the dark shades usually opaque. Lustre glassy. Fracture conchoidal. Specific gravity, 3·5 to 4·0. Hardness, 8. Scratches Quartz.

Infusible, and thus distinguished from Garnet, which it may resemble. Colour altered transiently by heat. Distinguished from Zircon by its superior hardness and inferior specific gravity.

Occurs in river sand; in igneous rocks, Gneiss, Limestone. The bright transparent varieties are used in jewellery. When red it forms the *Common*, or *Spinel*, or *Balas-Ruby*, which is distinguished from the Oriental Ruby by its inferior hardness; bright green, *Chlorospinel;* orange, *Rubicelle;* violet, *Almandine-ruby;* black, *Pleonast.*

174. **Spinellane or Nosean**—Newton, New Jersey, U.S.

175. **Spinellane or Nosean**—*With Pyroxene*—Monzoni, Tyrol, Austria.

176. **Spinellane (brown)**—*With Chondrorite and Graphite*—Warwick, New York, U.S.

177. **Spinellane (green)**—*With Serpentine, Mica, and Lime*—Franklin, New Jersey, U.S.

178. **Spinellane or Pleonaste**—Warwick, New York, U.S.

179. **Spinellane**—*on Pyroxene*—Stirling, New Jersey, U.S.

180. **Spinellane**—Edenville, New York, U.S.

ORTHOCLASE or FELSPAR.

Chemical Composition—Silica, Alumina, Potash or Soda (Lime).

Crystallized or in irregular masses. Opaque. Usually flesh red, or white, or of various dull tints. Glassy or pearly lustre. Fracture irregular, but in some directions it splits with an even glimmering cleavage face. Specific gravity, 2·3 to 2·8. Hardness, 6. Easily scratched by Quartz. Cannot be scratched with a knife without greatest pressure.

In thin edges fusible with difficulty.

Abundant in Granitic and Porphyritic rocks. No value. By its decomposition it forms Porcelain Clay or Kaolin.

181. **Orthoclase or Adularia**—Pfitsch, Tyrol, Austria.

182. **Orthoclase or Adularia** — *With Albite, Chlorite*—Pfitsch, Tyrol, Austria.

183. **Orthoclase**—St. Gotthard, Switzerland.

184. **Orthoclase**—St. Gotthard, Switzerland.

185. Orthoclase-crystallized—*With Tourmaline and Quartz*—Elba, Italy.
186. Orthoclase-crystallized—Fleims, Tyrol, Austria.
187. Orthoclase—Hirschberg, Silesia, Germany.
188. Orthoclase—Rosenbach, Silesia, Prussia, Germany.
189. Orthoclase—Chanteloube, near Limoges, France.
190. Orthoclase—*With Albite and Quartz*—Ytterby, Sweden.
191. Orthoclase—Hirschberg, Silesia, Germany.
192. Orthoclase—Arendal, Norway.
193. Orthoclase—Elbogen, Bohemia, Austria.
194. Orthoclase—Dresden, Saxony, Germany.
195. Orthoclase—Chesterfield, Massachusetts, U.S.
196. Orthoclase—*With Tourmaline, Mica, and Quartz*—Penig, Saxony, Germany.
197. Orthoclase—Bodemnais, Bavaria, Germany.
198. Orthoclase or Ice-spar—Mount Somma, Italy.
199. Orthoclase or Ice-spar—Eifel, Germany.
200. Orthoclase or Ice-spar—*In Trachyte*—Siebengebirge, on the Rhine, Germany.
201. Orthoclase or Ice-spar—*In Trachyte*—Siebengebirge, on the Rhine, Germany.
202. Retinite or Sphærulite—Meissen, Saxony, Germany.
203. Retinite or Sphærulite—Isle of Arran.
204. Retinite or Sphærulite—Tharand, Saxony, Germany.
205. Obsidian or Volcanic Glass—*Lapis Obsidianus* (*Plin.*), Iceland, Danish Province.
206. Kaolin or Porcelain Clay—St. Yrieix, Haute-Vienne, France.
207. Kaolin or Porcelain Clay—St. Yrieix, Haute-Vienne, France.
208. Kaolin or Porcelain Clay—St. Yrieix, Haute-Vienne, France.
209. Kaolin or Porcelain Clay—Aue, Saxony, Germany.
210. Weissigite—*In Amygdalophyre*—Weissig, Saxony, Germany.
211. Albite or Kieselspath—*With Quartz and Chlorite*—Dauphiné, France.
212. Albite or Kieselspath—*With Quartz*—(crist.)—Auerbach, Hesse, Germany.
213. Albite or Kieselspath—Schellerhau, Saxony, Germany.
214. Albite or Kieselspath—Finbo, Sweden.
215. Albite or Periklin—*Chlorite*—Pfitsch Valley, Tyrol, Austria.
216. Albite or Periklin—*With Mica*—Pfitsch Valley, Tyrol, Austria.
217. Oligoclase—Arendal, Norway.
218. Oligoclase—Brevig, Norway.
219. Labradorite—Labrador, North America.

220. Labradorite—Labrador, North America.
221. Labradorite—*Crystals in Melaphyre*—Vosges, France, and Germany.
222. Labradorite—Laconia, Greece.
223. Anorthite—Fossa della noulla Monte Somma, Italy.
224. Petalite—Ulton, Sweden.
225. Wernerite or Scapolite—*With Quartz*—Arendal, Norway.
226. Wernerite or Scapolite—*With Lime and Mica*—Laurvig, Norway.
227. Wernerite Paranthine or Scapolite—Bolton, Massachusetts, U.S.
228. Boltonite—Bolton, Massachusetts, U.S.
229. Dipyre—Maulcon, Pyrénées, France.
230. Leucite or Amphigene—Latium, Italy.
231. Leucite or Amphigene—Kaiserstuhl, Baden, Germany.
232. Leucite or Amphigene—Albano, Italy.
233. Nepheline—*With Lime*—Monte Somma, Italy.
234. Nepheline—Habichtswald, Hesse, Germany.
235. Nepheline or Pseudo-Nepheline—*With Melilite*—Capo di Bove, Italy.
236. Nepheline or Red Elæolite—*With Bergmannite*—Brevig, Norway.
237. Nepheline or Brown Elæolite—Brevig, Norway.
238. Nepheline or Elæolite—*With Orthose and Ægirine, or Black Hornblende*—Fredriksvärn, Norway.
239. Nepheline or Green Elæolite—*With Orthose and Titaniciron*—Fredricksvärn, Norway.
240. Tautolite—*With Ice-spar or Sphene*—Coblentz, Germany.
241. Hauyne—*On old Lava*—Andernach, near Coblentz, Germany.
242. Lapis Lazuli, Azurite or Lazulite—Cordillera d'Ovalle, Chili.
243. Wöhlerite—*With Ægirine, Syenite, Mica, and Elæolite*—Brevig, Norway.
244. Wöhlerite (green).
245. Leucophane and Radiolite—Brevig, Norway.
246. Melinophane—Brevig, Norway.
247. Eucolite—Brevig, Norway.

ACTINOTE, AMPHIBOLE, or HORNBLENDE.

Chemical Composition—Silica, Lime, Magnesia, Protoxide of Iron (occasionally Alumina and Fluorine).

In four, six, or eight-sided prisms, exhibiting cleavage in some directions. Usually opaque. Green, black, or white. Glassy, pearly, or resinous lustre. Specific gravity, 3 to 3·5. Hardness, 5 to 6. Can be scratched with a knife, using pressure. Scratched by Quartz.

Dark varieties fusible.

Augite usually occurs in stout six or eight-sided prisms with roof-like terminations; Hornblende, in long slender prisms; Asbestos is a variety composed of separable fibres like flax.

Abundant in igneous and other rocks. Of no value. Asbestos is used as a fire-proof material.

248. Amphibole or Pargasite—*With Idocrase and Calcite*—Warwick, New York, U.S.

249. Amphibole or Hornblende—*With Scapolite or Nuttalite*—Sterling, Massachusetts, U.S.

250. Amphibole or Hornblende—*In Wacke*—Bilin, Bohemia, Austria.

251. Amphibole or Hornblende—Arendal, Norway.

252. Amphibole or Hornblende—Hungary, Austria.

253. Amphibole or Hornblende—Zobten, Silesia, Germany.

254. Amphibole or Hornblende—*In Trachyte*—Siebengebirge on the Rhine, Germany.

255. Amphibole or Hornblende—Fahlun, Sweden.

256. Amphibole or Hornblende—Lizard, Cornwall, England.

257. Amphibole—Breitenbrunn, Saxony, Germany.

258. Amphibole or Hornblende—Engelsburg, Saxony, Germany.

259. Actinote or Stralstein—Grisons, Switzerland.

260. Amphibole or Hornblende—*In Trachyte*—Siebengebirge, on the Rhine, Germany.

261. Actinote—*Radiated on Mica-schiste*—Dauphiné, France.

262. Actinote—*With Compact Chlorite*—Pfitsch, Tyrol, Austria.

263. Actinote or Strahlstein—*With Talc*—Mount Greiner, Tyrol, Austria.

264. Actinote or Strahlstein—Coquimbo, Chili, South America.

265. Actinote or Strahlstein—Elba, Italy.

266. Actinote—Breitenbrunn, Saxony, Germany.

267. Grammatite, Tremolite, or Calamite—*With Iron*—Banat, Hungary, Austria.

268. Grammatite, Tremolite, or Calamite—*With Dolomite*—Campolongo, St. Gotthardt, Switzerland.

269. Grammatite, Tremolite, or Calamite—Lengfelden, Saxony, Germany.

270. Grammatite, Tremolite, or Calamite—Lengfelden, Saxony, Germany.

271. Pyroxene or Augite—Cantal, Auvergne, France.

272. Pyroxene or Augite—Teplitz, Bohemia, Austria.

273. Pyroxene or Augite—Kaiserthal, Baden, Germany.

274. Pyroxene or Augite—*In Melaphyre*—Bufaure, Tyrol, Austria.

275. Pyroxene or Augite—*In Wacke*—Bilin, Bohemia, Austria.

276. Pyroxene—*With Calcite*—Arendal, Norway.
277. Pyroxene or Augite—Arendal, Norway.
278. Pyroxene or Jeffersonite—Sterling, New Jersey, U.S.
279. Pyroxene or Diopside—*With Mica*—Mount Vesuvius, Italy.
280. Pyroxene or Tassaite—Fassa, Tyrol, Austria.
281. Pyroxene or Diopside—Reichenstein, Silesia, Prussia, Germany.
282. Pyroxene or Salite—*With Mica*—Sala, Sweden.
283. Pyroxene or Mussite—Reichenstein, Silesia, Prussia, Germany.
284. Pyroxene—Banat, Austria.
285. Pyroxene or Coccolite—Ural Mountains, Russia.
286. Pyroxene or Traversellite—*With Quartz*—Traversella, Piedmont, Italy.
287. Green Earth or Teladonite—Bufaure, Val di Fassa, Tyrol, Austria.
288. Smaragdite or Hornblende—Corsica.
289. Smaragdite or Hornblende—*In Eclogite*—Fichtelgeberge, Bavaria, Germany.
290. Diallage—(*Metallic*)—Volpersdorf, Silesia, Prussia, Germany.
291. Diaclasite or Hypersthene—Hartz, Germany.
292. Anthophyllite—*A variety of Hornblende—With Mica*—Pfitsch, Tyrol, Austria.
293. Bronzite—*A variety of Hornblende*—Kupferberg, Bavaria.
294. Asbestus and Albite—Dauphiné, France.
295. Asbestus—Valley of Fassa, Tyrol, Austria.
296. Asbestus—Valais, Switzerland.
297. Asbestus—Dognatzka, Banat, Austria.
298. Krokidolithe, or Blue Asbestus—Wakemback, near Schirmeck Vosges, Germany.
299. Wollastonite, Lime and Grenat—Oravilza, Banat, Austria.
300. Triphane, or Spodumene—Norwich, Connecticut, U.S.
301. Garnet or Grenat—St. Gotthard, Switzerland.
302. Garnet or Grenat, or Almandine—Ceylon.
303. Garnet or Grenat—*Alamandine in Mica-schiste*—Finland, Russia.
304. Garnet or Grenat, or Almandine—Greenland (Danish Colony).
305. Garnet Almadine or Grenat—*With Chlorite*—Ural Mountains, Russia.
306. Garnet, Massive Almandine, or Grenat—Arendal, Norway.
307. Garnet, Grenat, or Almandine—*With Talc-schiste*—St. Gotthard, Switzerland.
308. Garnet or Brown Grenat—Breitenbrunn, Saxony, Germany.
309. Garnet or Green Grenat—Knoughertown, Pennsylvania, U.S.

310. Garnet, Grenat, or Almandine—*On Trachyte*—Kaiserstuhl, Baden, GERMANY.
311. Garnet or Grenat—Fichtelgebirge, Bavaria, GERMANY.
312. Garnet or Grenat—Franklin, New Jersey, U.S.
313. Aplome, Garnet, or Grenat—Auerbach, Hesse, GERMANY.
314. Aplome, Garnet, or Grenat—Schwarzenberg, Saxony, GERMANY.
315. Aplome, Garnet, or Grenat—*With Lime and Wollastonite*—Oravitza, Banat, AUSTRIA.
316. Garnet or Romanzovite, or Grenat—Wermeland, SWEDEN.
317. Garnet or Colophonite, or Grenat—Lewis County, New York, U.S.
318. Garnet or Hessonite, or Grenat—Grisons, SWITZERLAND.
319. Garnet or Melanite, or Grenat—*With Pyroxine*—Franklin, New Jersey, U.S.
320. Garnet or Melanite, or Grenat—Kaiserstuhl, Baden, GERMANY.
321. Garnet or Melanite, or Grenat—Pfitsch, Tyrol, AUSTRIA.
322. Garnet or Spessartine, or Grenat—Haddam, Connecticut, U.S.
323. Garnet or Topazolite, or Grenat—Ala, Piedmont, ITALY.
324. Garnet or Pyrope, or Grenat—*In Serpentine*—Zoeblitz, Saxony, GERMANY.
325. Garnet or Pyrope, or Grenat—*In Semi-Opal*—Meronitz, Bohemia, AUSTRIA.
326. Helvine or Tetrahedal Garnet—*In Gneiss, accompanied by Blende, Calcite, Quartz, Fluorine, &c.*—Schwarzenberg, Saxony, GERMANY.
327. Idocrase or Vesuvian—Mount Vesuvius, ITALY.
328. Idocrase or Vesuvian—Sterling, New Jersey, U.S.
329. Idocrase or Vesuvian—Christiansand, NORWAY.
330. Idocrase or Egeran, or Vesuvian—Johann-Georgenstadt, Saxony, GERMANY.
331. Idocrase or Egeran, or Vesuvian—Eger, NORWAY.
332. Epidote or Pistacite—Oisans, Dauphiné, FRANCE.
333. Epidote or Pistacite—*With Grenat and Amphibole*—Arendal, NORWAY.
334. Epidote or Pistacite—*With Garnet, Calcite, Quartz*—Auerbach, Hesse, GERMANY.
335. Epidote or Pistacite—*Radiated*—Meissen, Saxony, GERMANY.
336. Epidote or Massive Pistacite—Arendal, NORWAY.
337. Epidote or Pistacite—Katharinenburg, Ural Mountains, RUSSIA.
338. Epidote—*Globular variety in a silicious and compact rock*—HUNGARY.
339. Loisite and Feldspar—Monzoni, Tyrol, AUSTRIA.
340. Loisite on Quartz—Fatigal, Tyrol, AUSTRIA.
341. Epidote or Pistracite—St. Marcel, Piedmont, ITALY.

342. **Withamite**—*Variety of Epidote*—Glencoe, Scotland.

343. **Orthite or Allanite**—*With Feldspar*—Plauen, near Dresden; Saxony, Germany.

344. **Orthite or Allanite**—*In Granite*—Stockholm, Sweden.

345. **Orthite or Allanite**—Westpoint, New York, U.S.

MICA.

Chemical Composition—Silica, Alumina, Magnesia, Potash, Iron.

Always crystallized in thin plates, which may be split into extremely thin flexible layers. Transparent in thin layers. Brown or black. Lustre glassy, pearly, or metallic. Streak white. Specific gravity, 2·7 to 3·1. Hardness, 2 to 2·5. Very easily scratched with a knife.

Infusible. Differs from Talc in not having a greasy feel, in being harder, and affording thinner layers perfectly transparent.

Abundant in Granite and Schist; fine particles common in Sandstone. Applied to various uses when in large plates, otherwise of no value. Was formerly used for glass in windows.

346. **Cerite, Black Allanite, or Cerium** — *(Red silicious oxyd)* — Riddarhytta, Sweden.

347. **Thorite in Syenite**—Brewig, Norway.

348. **Thorite or Orangite**—Brevig, Norway.

349. **Gadolinite in Pegmatite**—Finbo, Sweden.

350. **Mica or Brotite**—Hamburg, Mass, U.S.

351. **Mica or Brotite**—Finland, Russia.

352. **Mica**—*Bronze variety*—Arendal, Norway.

353. **Mica or Brotite**—*With Feldspar*—Hirschberg, Silesia, Germany.

354. **Mica or Brotite**—Zinnwald, Bohemia, Austria.

355. **Mica or Brotite**—*With Orthose*—Tamela, Finland, Russia.

356. **Mica**—(*Variety Brotite*)—*Acc. Min. Dolomite.*—Mount Vesuvius, Italy.

357. **Mica or Muscovite**—Eifel, Prussia, Germany.

358. **Mica or Muscovite**—Brevig, Norway.

359. **Mica or Muscovite**—Bolsena, Italy.

360. **Mica or Muscovite**—*With Chalcopyrite, Titanic Iron, and Calcite*—Arendal, Norway.

361. **Mica or Muscovite**—*With Quartz*—Pfitsch, Tyrol, Austria.

362. **Mica**—(*Banded variety*)—*In Wacke*—Teplitz, Bohemia, Austria.

363. **Lepidolite or Violet Mica**—Roczena, Moravia, Austria.

364. **Gilbertite**—Stonagwyn, Cornwall.

365. **Margarite**—Pfitsch, Tyrol, Austria.

366. **Norrite, and Galena on Gneiss**—Brand, near Freiberg; Saxony, Germany.

HYDROUS SILICATES.

TALC.

Chemical Composition—Silica, Magnesia, Water, Protoxide of Iron.

Usually in irregular layers. Nearly opaque. White or green. Pearly lustre. Greasy feel. Specific gravity, 2·7. Hardness, 1. Easily impressed by the nail; but impure varieties are much harder.

Infusible. [Yields no water when heated in a glass tube. Is not attacked by boiling sulphuric acid.]

Its greasy feel and pearly lustre readily distinguish it.

Mica, which is often confounded with it, is not so soft, has not a greasy feel, and can be split into very thin transparent layers. Steatite is a variety often applied to useful purposes.

367. **Talc and Dolomite**—Monzoni, Tyrol, Austria.

368. **Talc**—Vale of Fassa, Tyrol, Austria.

369. **Talc**—Valais, Switzerland.

370. **White and Coloured Talc**—Priessnitz, Saxony, Germany.

371. **Talc**—Zillerthal, Tyrol, Austria.

372. **Baltimorite**—Chester County, Pennsylvania, U.S.

CHLORITE.

Chemical Composition—Silica, Magnesia, Alumina, Protoxide of Iron, Water.

Often forming rocks. Opaque. Green of various shades. Lustre, pearly or dull. Hardness, 1 to 2. Very easily cut with a knife.

Infusible. [In glass tube yields water. Boiling sulphuric acid extracts from it Magnesia, Alumina, and Protoxide of Iron, which can be proved by chemical tests.]

Abundant; of no value.

373. **Chlorite**—(*Crystallized variety*)—*With Diopside*—Miask, Ural Mountains, Russia.

374. **Chlorite**—Vermont, U.S.

SERPENTINE.

Chemical Composition—Silica, Magnesia, Water, Protoxide of Iron.

Often forming rocks. Never crystallized. Opaque. Green. Lustre, resinous or dull. Streak, white. Hardness, 3. Can be cut with a knife. Specific gravity, 2·5.

Infusible except in thin edges; turns white in blowpipe flame. [Powder decomposed by sulphuric acid like Chlorite. Gives off water in glass tube.]

Some varieties form handsome stone for slabs and ornamental work.

Note.—Meerschaum, which is soft and earthy, and Nephrite (the New Zealand Maori Greenstone), which is as hard as Quartz, both contain Silica and Magnesia.

375. **Serpentine or Ophiolite**—Tyrol, Austria.

376. **Serpentine or Ophiolite**—Rossie, New York, U.S.

377. **Actinote or Strahlstein**—Chester, Pennsylvania, U.S.
378. **Serpentine or Ophiolite**—Zöblitz, Saxony, GERMANY.
379. **Serpentine or Ophiolite**—Zöblitz, Saxony, GERMANY.
380. **Serpentine or Ophiolite**—*With Lime*—St. Lawrence, New York U.S.
381. **Serpentine or Ophiolite**—*In decomposition*—Monte Catini, Tuscany, ITALY.
382. **Serpentine or Ophiolite or Picrolite**—Zöblitz, Saxony, GERMANY.
383. **Picrosmine**—Waldheim, Saxony, GERMANY.
384. **Chrysotile**—*(A variety of Serpentine)*—Reichenstein, Silesia, GERMANY.
385. **Bastite or Schiller-spar**—Baste, HARTZ.
386. **Pimelite on Serpentine**—Frankenstein, Silesia, GERMANY.
387. **Metaxcite**—Raschau, Saxony, GERMANY.
388. **Pinguite**—Schneefels, Saxony, GERMANY.
389. **Picrolite or Serpentine**—Waldheim, Saxony, GERMANY.
390. **Pyrophyllite**—Ottre, near Spaa, BELGIUM.
391. **Pyrophyllite**—*In Quartz*—Miask, Oural Mountains, RUSSIA.
392. **Agalmatolite, Figure-stone, Pagodite or Lardite**—"Fun Shih" of the Chinese, CHINA.
393. **Gymnite or Deweylite**—Fleims, Tyrol, AUSTRIA.
394. **Eisensteinmark or Teratolite**—Zwickau, SAXONY.
395. **Mountain-soap, Rock-soap, or Bolus**—Bilin, BOHEMIA.
396. **Lithomarge**—*(Kaolin-like substance)*—Johann-Georgenstadt, SAXONY.
397. **Halloysite**—*(Yellow variety)*—Angleure, near Liége, BELGIUM.
398. **Halloysite**—*(White variety)*—Angleure, near Liége, BELGIUM
399. **Bolus, Mountain-soap, or Rock-soap**—Kaiserstuhl, BADEN
400. **Alumocaloite**—Johann-Georgenstadt, Saxony, GERMANY.
401. **Ittnerite**—Ober-Bergen, Kaiserstuhl, Baden, GERMANY.
402. **Prehnite**—Pfitsch, Tyrol, AUSTRIA.
403. **Prehnite**—Oberstein, Palatinate, GERMANY.
404. **Prehnite**—Kilpatrick, near Glasgow, SCOTLAND.
405. **Prehnite**—Dumbarton, SCOTLAND.

THE ZEOLITES.

This name is used for a large class of Silicates, comprising from fifty to a hundred different Minerals, which all contain water as an essential ingredient, and which melt readily before the blowpipe, and boil up owing to the disengagement of steam. They occur filling pores and cavities in Basalt, Lava, and other rocks, They are usually white and well crystallized. Can be scratched with a knife. Of no value. Silica, Alumina, Lime, Soda, Potash, and Water, are the principal ingredients.

406. **Analcime**—*Cubicite or Cuboite.*—Cipit, Tyrol, AUSTRIA.

407. **Analcime**—*In Phonolite*—Aussig, Bohemia, AUSTRIA.
408. **Analcime**—*In Trachyt*—Kaiserstuhl, Baden, GERMANY.
409. **Analcime**—*In Cyclophyre*—Island of Cyclops, GREEK ARCHIPELAGO.
410. **Analcime**—(*Variety Cubicite or Cuboite*)—*In Dolerite*—Iceland, DANISH PROVINCE.
411. **Catapleiite or Katapleiit**—*Orthose and Aegérine*—Brevig, NORWAY.
412. **Apophyllite or Albine**—*With Mesotype*—Aussig, Bohemia, AUSTRIA.
413. **Apophyllite or Ichthyophthalmite**—*With Analcime*—Fassa, Tyrol, AUSTRIA.
414. **Mesotype or Natrolite**—*On Phonolite*—Hohentwiel, Baden, GERMANY.
415. **Mesotype or Natrolite**—Aussig, Bohemia, AUSTRIA.
416. **Mesotype or Natrolite**—Aussig, Bohemia, AUSTRIA.
417. **Mesotype or Natrolite**—Fassa, Tyrol, AUSTRIA.
418. **Mesotype, Natrolite, or Bergmannite and Amphibole**—Brevig, NORWAY.
419. **Okenite**—Greenland, DANISH PROVINCE.
420. **Thomsonite and Analcime**—Kilpatrick, SCOTLAND.
421. **Laumontite**—Plauen, near Dresden, GERMANY.
422. **Laumontite**—Kilpatrick, SCOTLAND.
423. **Heulandite or Foliated Zeolite**—FAROE ISLANDS.
424. **Heulandite**—*With Chabasie*—Kaiserstuhl, Baden, GERMANY.
425. **Heulandite**—(*Red variety*)—Kilpatrick, SCOTLAND.
426. **Stilbite or Radiated Zeolite**—Nova Scotia, NORTH AMERICA.
427. **Stilbite or Radiated Zeolite**—Dumbarton, SCOTLAND.
428. **Stilbite**—*With Calcite*—Kilpatrick, SCOTLAND.
429. **Stilbite or Radiated Zeolite**—Andreasberg, Hartz, GERMANY.
430. **Phacolite or Chabazite**—Lobositz, Bohemia, AUSTRIA.
431. **Chabasie or Chabazite**—FAROE ISLANDS.
432. **Chabasie or Chabazite**—Aussig, Bohemia, AUSTRIA.
433. **Chabasie or Chabazite**—Teplitz, Bohemia, AUSTRIA.
434. **Chabasie or Chabazite**—Kilpatrick, SCOTLAND.
435. **Comptonite or Thomsonite**—Töplitz, Bohemia, AUSTRIA.
436. **Gismondine or Abrazite**—Monte Somma, Vesuvius, ITALY.
437. **Crocalite (?)**—Fassa, Tyrol, AUSTRIA.
438. **Tanjasite (?)**—Kaiserstuhl, Baden, GERMANY.
439. **Harmotome or Kreuzstein**—Andreasberg, Hartz, GERMANY.
440. **Harmotome or Kreuzstein**—Andreasberg, Hartz, GERMANY.
441. **Harmotome or Kreuzstein**—*With Calcite*—Oberstein, Palatinate, GERMANY.

Part II.

ANHYDROUS CARBONATES.

HYDROUS AND ANHYDROUS PHOSPHATES AND SULPHATES, NITRATES, FLUORIDS, CHLORIDS, ETC.

CALC-SPAR or CALCITE.

Chemical Composition—Carbonic Acid, Lime.

In rhombohedrons and other crystalline forms. Also massive, earthy, or fibrous. Transparent or opaque. White when pure; often tinted. Lustre glassy or dull. Breaks with smooth cleavage planes parallel to the rhombohedral faces. Specific gravity, 2·5 to 2·8. Hardness, 3. Easily scratched with a knife; streak white.

Infusible before the blowpipe, but emits a strong light. When burned, as in a kiln, it forms quicklime. Effervesces when vinegar is poured upon it. It completely dissolves in nitric acid with rapid effervescence.

Calc-spar is one of the most abundant minerals; it occurs in cavities and veins in all kinds of rock. The term Calc-spar or Calcite is restricted to the crystallized variety. In an imperfectly crystallized and compact form it exists in large rocky masses and beds; all Marbles and Limestones consist of it, mixed more or less with impurities. Chalk and Stalactites are nearly pure carbonate of lime. All varieties of carbonate of lime may be easily distinguished by being scratched with a knife, giving a white streak whatever the colour of the mass may be, by effervescing with an acid, and by being infusible.

442. **Calcite or Calcareous-spar**—Iceland-spar, Iceland, Danish Province.

443. **Calcite or Calcareous-spar**—Millan, Aveyron, France.

444. **Calcite**—Auerbach, Hesse, Germany.

445. **Calcite**—Old Matlock, Derbyshire, England.

446. **Calcite**—Schwarzenberg, Saxony, Germany.

447. **Calcite**—*With Quartz*—Tharand, Saxony, Germany.

448. **Calcite**—*With Limonite*—Hartz, Germany.

449. **Calcite**—Töplitz, Bohemia, Austria.

450. **Calcite**—Monte Uliveto, Tuscany, Italy.

451. **Calcite**—Monte Uliveto, Tuscany, Italy.

452. **Calcite**—Sinsheim, Baden, Germany.

453. **Calcite**—*With Pyrites*—Westphalia, Germany.

454. **Calcite**—*With Pyrites*—Mexico, North America.

455. **Calcite**—Iberg, Hartz, Germany.

456. **Calcite**—*With Quartz, Mispickel, Chrysolite, and Serpentine*—Reichenstein, Silesia, Prussia, Germany.

457. **Calcite**—Millan, Aveyron, France.

458. **Calcite**—Porte de France, Grenoble, France.

459. **Calcite**—*With Blende*—Alston, Cumberland, England.

460. Calcite—Tonnerre, Yonne, FRANCE.
461. Calcite—Dijon, FRANCE.
462. Calcite—*With Quartz, Galena, and Siderose*—Schneeberg, Saxony, GERMANY.
463. Calcite—Grenoble, FRANCE.
464. Calcite—*With Quartz and Fluorine*—Alston, Cumberland, ENGLAND.
465. Calcite—*With Barytine*—Alston, Cumberland, ENGLAND.
466. Calcite—*With Siderose*—Münsterthal, Baden, GERMANY.
467. Calcite—Münsterthal, Baden, GERMANY.
468. Calcite—Flogny, Yonne, FRANCE.
469. Calcite—*With Pearl-spar*—Framont, Vosges, FRANCE.
470. Calcite—Grenoble, FRANCE.
471. Calcite—*With Quartz*—Bourg d'Oisans, Isére, FRANCE.
472. Calcite—*With Quartz*—Andreasberg, Hartz, GERMANY.
473. Calcite—*With Quartz*—Andreasberg, Hartz, GERMANY.
474. Calcite—*With Quartz*—Andreasberg, Hartz, GERMANY.
475. Calcite—Andreasberg, Hartz, GERMANY.
476. Calcite—Matlock, Derbyshire, ENGLAND.
477. Calcite—Derbyshire, ENGLAND.
478. Calcite—Derbyshire, ENGLAND.
479. Calcite—Lyons, FRANCE.
480. Calcite—Dudley, near Birmingham.
481. Calcite—*With Pyrites, Barytine*—Bretagne, FRANCE.
482. Calcite—Périgueux, Dordogne, FRANCE.
483. Calcite—Zwickau, Saxony, GERMANY.
484. Calcite—Schneeberg, Saxony, GERMANY.
485. Calcite—*With Pyrites*—Saxony, GERMANY.
486. Calcite—Bohemia, AUSTRIA.
487. Calcite—*With Galena*—Andreasberg, Hartz, GERMANY.
488. Calcite—Johann-Georgenstadt, Saxony, GERMANY.
489. Calcite—*With Brown-spar*—Pyrenees, SPAIN.
490. Calcite—*With Quartz*—Biella, Piedmont.
491. Calcite—Borna, Saxony, GERMANY.
492. Calcite—*Blue variety*—Oravitza, Banat, AUSTRIA.
493. Calcite—Grenoble, FRANCE.
494. Calcite or Schieferspath—Schwarzenberg, Saxony, GERMANY.
495. Calcite or Satin-spar—Alston, Cumberland, ENGLAND.
496. Calcite, Regenstein, Roe-stone—Thuringia, Prussia, GERMANY.
497. Calcite or Stalactite—Gailenreuth, Bavaria, GERMANY.

498. **Calcite, Stalactite**—Valais, Switzerland.

499. **Calcite**—*Schaumkalk, pseudo-morphous Gypsum*—Thuringia, Germany.

500. **Calcite, Tufa**—Kansas, U.S.

501. **Pearl-spar**—Joachimsthal, Bohemia, Austria.

502. **Pearl-spar, and Green-earth**—Framont, Vosges, France.

503. **Pearl-spar, Quartz, and Copper Pyrites**—Alston, Cumberland, England.

504. **Brown-spar, on Ferruginous Slate**—Tharand, Saxony, Germany.

505. **Pearl-spar**—Niagara, New York, U.S.

506. **Pearl-spar**—Freiberg, Saxony, Germany.

507. **Pearl-spar**—Blankenstein, Saxony, Germany.

508. **Pearl-spar**—Blankenstein, Saxony, Germany.

509. **Pearl-spar**—*On Iron Pyrites*—Mexico, North America.

510. **Pearl-spar**—Traversella, Piedmont, Italy.

DOLOMITE.

Chemical Composition.—Carbonic Acid, Lime, Magnesia.

In rhombohedrons, faces often curved. Often granular or massive. White or dull tinted. Glassy or pearly. Specific gravity, 2·8 to 2·9. Hardness, 3·5 to 4.

Infusible. Effervesces in nitric acid, and dissolves more slowly than Calc-spar. Yields quicklime when burnt. Occurs in extensive beds of various ages like Limestone. Used as a building-stone, and in the manufacture of Epsom Salts. Difficult to distinguish from Calcite without chemical analysis.

511. **Dolomite or Magnesian Limestone**—Traversella, Piedmont, Italy.

512. **Dolomite**—*In Chlorite-slate*—Pfitch, Tyrol, Austria.

513. **Miemite**—Tuscany, Italy.

514. **Dolomite**—Plauen, Saxony, Germany.

515. **Dolomite**—Valais, Switzerland.

516. **Breunerite**—*In Chlorite-slate*—Pfitsch, Tyrol, Austria.

517. **Giobertite, Magnesite, or Carbonate of Magnesia**—Kosemitz, Silesia, Germany.

518. **Giobertite or Magnesite**—Kaiserstuhl, Baden, Germany.

519. **Giobertite**—Grochberg, Saxony, Germany.

ARAGONITE.

Chemical Composition.—Same as Calc-spar.

It differs from Calc-spar in its crystalline form, which is usually difficult to discern. It often occurs in fibrous clusters or in tangled branches. Hardness, 3·5 to 4·0. Specific gravity, 2·9.

It has the general characters of Calc-spar, but may be distinguished from it by falling to powder in the blowpipe flame, as well as by its superior hardness.

520. **Aragonite, Needle-spar, or Argonspath**—Herrengrund, Hungary, Austria.

521. **Aragonite**—*A twin crystal*—Monte-Somma, Vesuvius, Italy.

522. **Aragonite**—*Aciculaire and Pearl-spar*—Marienberg, Saxony, Germany.

523. **Aragonite**—Marienberg, Saxony, Germany.

524. **Aragonite**—*On Carbonate of Iron*—Siegen, Prussia, Germany.

525. **Aragonite**—*Aciculaire on Toad-stone*—Gergovia, Puy de Dôme, France.

526. **Aragonite**—*On Dolerite*—Kaiserstuhl, Baden, Germany.

527. **Aragonite or Igloite**—Iglo, Hungary, Austria.

528. **Aragonite**—Bilin, Bohemia, Austria.

529. **Aragonite**—Meissner, Hesse, Germany.

530. **Aragonite**—Zittau, Saxony, Germany.

531. **Aragonite**—Zorge, Hartz, Germany.

532. **Aragonite**—*Fibrous*—Teplitz, Germany.

533. **Aragonite**—*Fibrous*—St. Nectaire, Auvergne, France.

534. **Aragonite**—*Fibrous and radiated*—Kaiserstuhl, Baden, Germany.

535. **Aragonite**—*Fibrous and radiated*—Alston, Cumberland, England.

536. **Aragonite**—Karlsbad, Bohemia, Austria.

537. **Aragonite or Needle-spar**—Schams, Tyrol, Austria.

PHOSPHATES.

APATITE.

Chemical Composition—Phosphoric Acid, Lime, Fluorine.

In six-sided prisms. Also in masses. Transparent or opaque. Usually green. Sometimes white, yellow, blue, red, brown. Lustre resinous. Fracture conchoidal or uneven. Specific gravity, 3·2. Hardness, 5. Can be scratched with a knife, using pressure.

Infusible, except on very thin edges. Some kinds phosphoresce when heated. The pure mineral in powder dissolves slowly in nitric acid without effervescence. The crystals may resemble Beryl, which, however, is too hard to be scratched with a knife.

Occurs in Gneiss, Slate, Limestone. Of little or no value at present, but of increasing interest from its use in the manufacture of artificial manures.

538. **Apatite or Phosphate of Lime**—*Crystallized*—Ehrenfriedersdorf, Saxony, Germany.

539. **Apatite**—*Grey, with Fluorine*—Altenberg, Saxony, Germany.

540. **Apatite**—Schlackenwald, Bohemia, Austria.

541. Apatite—*With Quartz*—Johann-Georgenstadt, Saxony, GERMANY.
542. Apatite—Massachusetts, U.S.
543. Apatite or Morodite—*With Granite, Epidote*—Arendal, NORWAY.
544. Apatite—Arendal, NORWAY.
545. Apatite—*Phosphorite*—Amberg, Bavaria, GERMANY.

FLUORIDS.

FLUOR-SPAR, FLUOR, OR FLUATE OF LIME.

Chemical Composition.—Fluoride of Calcium.

In cubes or octahedrons; also in masses. Transparent or opaque. White or light violet, blue, green, or yellow; sometimes layers of different tints in the same piece. Lustre glassy. Breaks with smooth cleavage planes parallel to the octahedral faces. Specific gravity, 3·0 to 3·2. Hardness, 4. Can be scratched with a knife, but not so easily as Calcite.

Fusible with difficulty; generally flies to pieces when heated. Some varieties phosphoresce.

Occurs in veins with Lead and Silver ores. Used in etching glass, and as a flux in smelting; sometimes for ornaments, but is too brittle. Abundant in many countries, and of little value.

546. Fluor-spar—*Blue John, Fluate of Lime*—Stolberg, Hartz, GERMANY.
547. Fluor-spar—Marienberg, Saxony, GERMANY.
548. Fluor-spar—Wierdale, Durham, ENGLAND.
549. Fluor-spar—Münsterthal, Baden, GERMANY.
550. Fluor-spar—*With Blende, Pearl-spar*—Alston, Cumberland, ENGLAND.
551. Fluor-spar—Alston, Cumberland, ENGLAND.
552. Fluor-spar—Alston, Cumberland, ENGLAND.
553. Fluor-spar—*White variety, with Barytine*—Freiburg, Saxony, GERMANY.
554. Fluor-spar—*With Quartz and Calcite*—Derbyshire, ENGLAND.
555. Fluor-spar—*With Quartz*—Schneeberg, Saxony, GERMANY.
556. Fluor-spar—Schlackenwald, Bohemia, AUSTRIA.
557. Fluor-spar—*Rose variety, with Quartz*—St. Gotthardt, SWITZERLAND.
558. Flour-spar—*Green Octahedron*—Liskeard, Cornwall, ENGLAND.
559. Fluor-spar—*With Chalcopyrites*—Neiderpoebel, Saxony, GERMANY.
560. Fluor-spar—Stolberg, Hartz, GERMANY.
561. Fluor-spar—*With Barytine*—Broterode, Hartz, GERMANY.
562. Fluor-spar—*With Galena*—Alston, Cumberland, ENGLAND.
563. Fluor-spar—*Blue John*—Castleton, Derbyshire, ENGLAND.
564. Fluor-spar—*Blue John*—Castleton, Derbyshire, ENGLAND.
565. Fluor-spar—Ville Franche, near Lyon, FRANCE.

566. **Fluorine**—*Blue and White*—Tuscany, Italy.

567. **Fluorine**—*Compact variety*—Hartz, Germany.

637. **Cryolite or Icestone**—*on Gneiss, with Siderose, Quartz, Chalcopyrite, Limonite, &c.*—Ivikaet near Arksutfiord, Greenland.

HYDROUS SULPHATES.

SULPHATE OF LIME, GYPSUM, &c.

Chemical Composition—Sulphuric Acid, Lime, Water.

In prisms with oblique terminations; sometimes resembling an arrow-head. Transparent or opaque. White or dull-tinted. Glassy, pearly, or satin lustre. Cleavage occurs easily in one direction. Specific gravity, 2·3. Hardness, 2. Very easily cut with a knife.

Fusible with difficulty. In the blow-pipe flame it becomes white and opaque without fusing, and can be easily crumbled between the fingers. Nitric acid does not cause effervescence.

Occurs in fissures and in stratified rocks, often forming extensive beds. When burnt it forms Plaster of Paris; it is also used for ornaments, and as a manure.

569. **Gypsum or Sulphate of Lime**—Rheinhardsbrunn, near Gotha, Germany.

570. **Gypsum, Sulphate of Lime, or Plaster of Paris**—Tuscany, Italy.

571. **Gypsum**—Paris, France.

572. **Gypsum**—Paris, France.

573. **Gypsum**—Paris, France.

574. **Gypsum**—Paris, France.

575. **Gypsum**—Nevers, France.

576. **Gypsum**—Tuscany, Italy.

577. **Gypsum**—Black Forest, Baden, Germany.

578. **Gypsum**—Pyrenees, Spain.

579. **Gypsum**—Eisleben, Thuringia, Germany.

580. **Gypsum**—*Fibrous*—Derbyshire, England.

581. **Gypsum**—*Alabaster*—Tuscany, Italy.

582. **Gypsum**—Paris, France.

628. **Epsomite or Epsom Salt**—Spain.

634. **Polyhalite**—Varengeville, Nancy, France.

636. **Glauber's Salt, or Sulphate of Soda**—Madrid, Spain.

642. **Websterite, Sub-sulphate of Alumina, Aluminite**—Newhaven, Sussex, England.

643. **Websterite, Sub-sulphate of Alumina, Aluminite**—Paris, France.

644. **Alum or Native Alum**—Tolfa, Italy.

ANHYDROUS SULPHATES.

HEAVY SPAR or BARYTES.

Chemical Composition—Sulphuric Acid, Baryta.

In tabular glassy crystals; also in dull masses. Transparent or opaque. White or tinted. Specific gravity, 4·3 to 4·8; its great comparative weight readily distinguishes it. Hardness, 2·5 to 3·5. Splinters fly off the crystals when heated in the blow-pipe flame. Fusible with difficulty. Not acted upon by acids.

Occurs with various ores. Used as a white paint.

584. Barytes or Heavy-spar—Dufton, Northumberland, England.
585. Barytes or Heavy-spar—Felsöbanya, Hungary, Austria.
586. Barytes or Heavy-spar—Siegen, Prussia, Germany.
587. Barytes or Heavy-spar—Schemnitz, Hungary, Austria.
588. Barytes or Heavy-spar—Przibram, Bohemia, Austria.
589. Barytes or Heavy-spar—Münsterthal, Baden, Germany.
590. Barytes or Heavy-spar—Freiberg, Saxony, Germany.
591. Barytes or Heavy-spar—Freiberg, Germany.
592. Barytes or Heavy-spar—Hungary, Austria.
593. Barytes or Heavy-spar—Marienberg, Saxony, Germany.
594. Barytes or Heavy-spar—Vosges, France.
595. Barytes or Heavy-spar—Auvergne, France.
596. Barytes or Heavy-spar—*With Blende, Grey Copper, and Quartz*—Mexico, Southern North America.
597. Barytes or Heavy-spar—Freiberg, Saxony, Germany.
598. Barytes or Heavy-spar—Schapbach, Baden, Germany.
599. Barytes or Heavy-spar—Braunsdorf, Saxony, Germany.
600. Barytes or Heavy-spar—Glashütte, Saxony, Germany.
601. Barytes or Heavy-spar—Münsterthal, Baden, Germany.
602. Barytes or Heavy-spar—Hexham, Northumberland, England.
603. Barytes or Heavy-spar—Schapbach, Baden, Germany.
604. Barytes or Heavy-spar—Sion, Valais, Switzerland.
605. Barytes or Heavy-spar—*With Quartz*—Joachimsthal, Bohemia, Austria.
606. Barytes or Heavy-spar—*Red variety*—Keswick, England.
607. Barytes or Heavy-spar—Przibram, Bohemia, Austria.
608. Barytes—*Pseudomorphous—With Calcite*—Valais, Switzerland.
633. Glauberite and Rock Salt—Varengeville, Nancy, France.
568. Karstenite, Muriacite, or Anhydrite—Hallstadt, Tyrol, Austria.

ANHYDROUS CARBONATES.

609-612. **Witherite Carbonate of Heavy-spar**—Fallowfield, near Hexham, ENGLAND.

613 & 614. **Barytocalcite**—Bleagill, near Alston, Cumberland, ENGLAND.

615. **Alstonite or Bromlite**—*With Calcite, Witherite, Galena, &c.*—Bromley Hill, near Alston, Cumberland, ENGLAND.

616. **Celestine or Sulphate of Strontian**—*With Sulphur*—Sicily, ITALY.

617. **Celestine**—*With Sulphur*—Girgento, Sicily, ITALY.

618. **Celestine**—*With Sulphur*—Girgento, ITALY.

619. **Celestine**—Bristol, ENGLAND.

620. **Celestine**—*Blue variety, with Calcite*—Salzburg, AUSTRIA.

621. **Celestine**—*On Limestone*—Seisseralp, Tyrol, AUSTRIA.

622. **Celestine**—Auteuil, Paris, FRANCE.

623. **Celestine**—Montmartre, Paris, FRANCE.

624. **Celestine**—Montmartre, Paris, FRANCE.

CHLORIDS.

ROCK SALT.

Rock salt has the character of ordinary table salt, but is more or less impure. Occurs in beds interstratified with sandstones and clays, which are usually of a red colour and associated with Gypsum. In the County of Cheshire in England, where Salt Mines are worked, the surface indications are brine springs, supporting a vegetation like that near the sea-coast; also, occasional sinking of the soil caused by the removal of the subterranean bed of salt, by spring water in some cases, and by mining operations in others. Small and unimportant quantities of salt are often found encrusting various rocks in dry weather.

630. **Rock Salt**—Varengeville, near Nancy, FRANCE.

631. **Red Rock Salt**—Hallstadt, AUSTRIA.

632. **Rock Salt**—Tuscany, ITALY.

HYDROUS PHOSPHATES.

583. **Pharmacolite**—*On Barytes*—Schapbach, Baden, GERMANY.

638. **Wavellite or Sub-phospate of Alumina**—Longenstriegis, SAXONY.

639. **Wavellite or Sub-phospate of Alumina**—Longenstriegis, SAXONY.

640. **Wavellite or Sub-phosphate of Alumina**—Longenstriegis, SAXONY.

625. **Strontianite or Carbonate of Strontian**—*With Barytine*—Clausthal, Hartz, Germany.

626. Strontianite—Strontian, Scotland.

641. Lazolite, Lazurstone, Klaprothine or Blue Spar—*On Clay-slate*—Werfen, Salzburg, Austria.

HYDROUS OXIDS.

627. Brucite or Native Hydrate of Magnesia—Hoboken, New Jersey, U.S.

BORATES.

629. Boracite or Borate of Magnesia — *In Gypsum* — Lüneburg, Germany.

NITRATES.

NITRE or SALTPETRE.

Nitre or Saltpetre is a soluble mineral. It has a cooling taste. It can easily be distinguished by the vivid manner in which it burns on red hot charcoal.

635. Nitratine, Nitrate of Soda, Natron, or Saltpetre—Tarapaca, Peru, South America.

Part III.

METALS.

IRON SECTION.

NATIVE IRON.

Chemical Composition—Iron, with a small percentage of Nickel.

645. Meteoric Iron—Resembles ordinary Iron. Malleable. Is attracted by a magnet. Specific gravity, 7·0 to 7·8.—Atacama, Chili, South America.

646. Aerolite—Fell on 9th December, 1858.—Ausson, near Montrégean, Haute-Garonne, France.

IRON PYRITES.

Chemical Composition—Iron, 467; Sulphur, 533.

In cubes and allied forms; sides often marked by fine parallel lines. Also massive. Brass yellow. Lustre metallic. Fracture irregular. Specific gravity, 4·8 to 5·1. Hardness, 6· to 6·5. Cannot be scratched with a knife; scratched by Quartz; scratches glass with great facility. Strikes fire with steel (the origin of the term *pyrites*).

Before the blow-pipe it blows with a blue flame, giving off an odour of Sulphur, and ultimately fuses into a black magnetic globule.

Abundant. Used as a source of Sulphur; also in the manufacture of Alum. Occasionally auriferous. This ore and arsenical pyrites form the "mundic" of miners. It is easily distinguished from Copper pyrites by its hardness, Copper pyrites being easily cut with a knife. Distinguished from Gold by its hardness and in not being malleable, and in giving off sulphurous odours in the blow-pipe flame.

647. **Iron Pyrites**—Elba, ITALY.

648. **Iron Pyrites**—Traversella, Piedmont, ITALY.

649. **Iron Pyrites**—Freiberg, Saxony, GERMANY.

650. **Iron Pyrites**—*With Chalcopyrites and Quartz*—Atacama, Chili, SOUTH AMERICA.

651. **Iron Pyrites**—Miquera, Chili, SOUTH AMERICA.

652. **Iron Pyrites and Brown-spar**—Siegen, Prussia, GERMANY.

653. **Iron Pyrites**—*In Siderose*—Linz on the Rhine, GERMANY.

654. **Iron Pyrites**—Namur, BELGIUM.

655. **Iron Pyrites**—Schneeberg, Saxony, GERMANY.

656. **Iron Pyrites**—Liskeard, Cornwall, ENGLAND.

657. **Iron Pyrites**—Rossie, New York.

658. **Iron Pyrites**—Framont, Vosges, FRANCE.

659. **Iron Pyrites**—Schemnitz, Hungary, AUSTRIA.

660. **Iron Pyrites**—Liskeard, Cornwall, ENGLAND.

661. **Iron Pyrites**—*Pseudomorphous Variety*—Millan, Aveyron, FRANCE.

662. **Iron Pyrites**—*On Clay-slate*—Angers, FRANCE.

663. **White Iron Pyrites or Marcasite**—EGER, Bohemia, AUSTRIA.

664. **White Iron Pyrites or Marcasite**—*On Barytes*—Freiberg, Saxony, GERMANY.

665. **White Iron Pyrites or Marcasite**—Ems, Nassau, GERMANY.

666. **White Iron Pyrites or Marcasite**—Schneeberg, Saxony, GERMANY.

667. **White Iron Pyrites or Marcasite**—Alais, GARD.

668. **Marcasite**—Badenweiler, Baden, GERMANY.

669. **Magnetic Pyrites or Pyrrhotine**—Bodenmais, Bavaria, GERMANY.

670. **Pyrrhotine**—Sion, Valais, SWITZERLAND.

ARSENICAL PYRITES OR MISPICKEL.

Chemical Composition—Iron, 344; Arsenic, 196; Sulphur, 460.

In flattened prisms; also massive. White. Lustre metallic. Streak grey. Fracture uneven. Specific gravity, 6·0 to 6·3. Hardness, 5·5. Cannot be scratched with a knife; scratched by Quartz.

Heated before the blow-pipe, it gives off white arsenical fumes of a garlic odour, and ultimately fuses into a black globule.

Abundant in mining districts; sometimes auriferous.

This ore and Iron Pyrites form the "Mundic" of miners.

671. **Mispickel**—Freiberg, Saxony, GERMANY.

672. **Mispickel**—*With Siderose and Quartz*—Freiberg, Saxony, GERMANY.

673. **Mispickel**—Reichenstein, Silesia, GERMANY.

674. **Mispickel**—Cieux, Haute-Vienne, FRANCE.

675. **Mispickel**—Altenberg, Saxony, GERMANY.

676. **Mispickel**—Breitenbrunn, Saxony, GERMANY.

677. **Mispickel**—Lobenstein, Thuringia, GERMANY.

MAGNETITE OR MAGNETIC IRON.

Chemical Composition—Iron, 724; Oxygen, 276.

In octahedrons and dodecahedrons. Also in masses *(lodestone)* and in grains. Black. Lustre metallic. Streak or powder black. Fracture irregular. Specific gravity, 5·0 to 5·2. Hardness, 5·5 to 6·5. Not scratched with a knife. Magnetic; it can attract Iron filings. Is itself attracted by a magnet.

Infusible. With borax bead gives the indications of Iron.

Occurs in many rocks, sometimes in beds, or forming mountainous masses; common in river sands. Used as an ore of Iron.

678. **Magnetite, or Magnetic Iron Ore**—Elba, ITALY.

679. **Magnetite, or Magnetic Iron Ore**—Greiner, Tyrol, AUSTRIA.

680. **Magnetite and Jenkensite**—Orange County, New York, U.S.

681. **Magnetite**—Elba, ITALY.

682. **Magnetite**—Breitenbrunn, Saxony, GERMANY.

683 & 684. **Magnetite or Oxidulated Iron**—Arendal, NORWAY.

TITANIC IRON.

Chemical Composition—Oxides of Iron and Titanic Acid, in variable proportions.

In octahedrons or in tabular plates. Also in grains. Black. Lustre metallic. Streak or powder black. Specific gravity, 4·5 to 5·3. Hardness, 5· to 6·5. Not scratched with a knife.

Infusible. With borax gives the indications of Iron. [With microcosmic salt, which is often used instead of borax in an exactly similar way, it gives a red bead in the reducing part of the flame, but rather a large quantity of the mineral must be used to obtain this result.]

It is sometimes magnetic.

Its black streak or powder distinguishes it from Specular Iron, which it often resembles. Common in river sand. Of little or no value in the arts.

685. **Iserine or Slag-like Magnetic Iron**—*In Dolerite*—Kaiserstuhl, Baden, GERMANY.

686. **Iserine**—*In Basalt*—Linz on the Rhine, GERMANY.

687. **Iserine or Titanic Iron-sand**—St. Brieuc, Côtes du Nord, FRANCE.

CHROMIC IRON.

Chemical Composition—Sesquioxide of Chromium, Protoxide of Iron, (Alumina, Magnesia).

In octahedrons. Usually massive. Black. Lustre faintly metallic. Streak or powder dark brown. Fracture irregular. Specific gravity, 4·4 to 4·6. Hardness, 5·5. Not scratched with a knife.

Infusible. With borax bead gives the characteristic indications of Chromium.

Occurs in Serpentine. Used in the preparation of Chromium colours.

688. **Chromic Iron or Chromate of Iron**—Baltimore, U.S.

689. **Chromic Iron and Grenat**—Bahia, Brazil, SOUTH AMERICA.

690. **Ilmenite, Titanite of Iron, or Crichtonite**—*On Quartz*—Oisans, Dauphiné, FRANCE.

691. **Ilmenite and Spinel**—Warwick, New York, U.S.

SPECULAR IRON, HEMATITE, OR MICACEOUS IRON.

Chemical Composition—Iron, 70; Oxygen, 30.

In tabular crystals or scales; also fibrous, massive, granular, earthy. Colour black. Streak or powder, red. Lustre, metallic or dull. Specific gravity, 4·5 to 5·3. Hardness of crystals, 5·5 to 6·5. Not scratched with a knife. Earthy varieties softer, and can be scratched with a knife.

Infusible. With borax bead gives the indications of Iron. An abundant ore of Iron. Often gradually changes into red or brown ochre.

692–694. **Hematite or Specular Iron**—Elba, ITALY.

695 & 696. **Hematite or Specular Iron**—Whitehaven, Cumberland, ENGLAND.

697 & 698. **Hematite or Specular Iron**—Framont, Vosges, FRANCE.

699. **Red Iron Ore or Specular Iron or Hematite**—Schneeberg, Saxony, GERMANY.

700. **Red Iron Ore**—Phillipstadt, SWEDEN.

701. Red Iron Ore—Elba, ITALY.
702. Red Iron Ore or Itibarite—Brazil, SOUTH AMERICA.
703. Hematite or Kidney Ore—Whitehaven, Cumberland, ENGLAND.
704. Hematite or Red Iron Ore—Ulverston, Lancashire, ENGLAND.
705. Hematite or Red Iron Ore—Ems, Nassau, GERMANY.
706. Hematite or Red Iron Ore—*Compact variety*—Dognatz, Banat, AUSTRIA.
707. Hematite and Brown-spar—Altenberg, Saxony, GERMANY.
708. Hematite—*Ochre variety*—Goslar, Hartz, GERMANY.
709. Hematite—Zwickau, Saxony, GERMANY.
710. Hematite or Clay Iron Stone—Teplitz, Bohemia, AUSTRIA.
711. Gœthite, Phyrrhosiderite, or Velvet Iron Ore—*With Quartz*—Tavistock, Devonshire, ENGLAND.
712. Gœthite, Przibramite, or Velvet Iron Ore—Przibram, Bohemia, AUSTRIA.

LIMONITE OR BROWN IRON ORE.

Chemical Composition—Oxide of Iron, Water.

Of a brown yellow or black colour. Earthy, fibrous, stalactitic. Scratches with a knife. Blackens before the blow-pipe. With borax bead gives the indications of Iron. An abundant Iron ore.

713. Limonite or Brown Hematite—Ural Mountains, RUSSIA.
714. Limonite or Brown Iron Ore—Zwickau, Saxony, GERMANY.
715. Limonite or Hydrous Peroxide of Iron—Viedessos, Ariège, FRANCE.
716. Limonite—Siegen, Prussia, GERMANY.
717. Limonite—Schmalkalden, Hesse, GERMANY.
718. Limonite—Berann, Bohemia, AUSTRIA.
719. Limonite or Pitch Iron Ore—Hof, Bavaria, GERMANY.
720. Limonite—Braubach, Nassau, GERMANY.
721. Limonite—Kandern, Baden, GERMANY.
722. Limonite—*Oolitic in Spilite*—Hof, Bavaria, GERMANY.
723. Limonite—*Oolitic*—St. Quentin, Isère, FRANCE.
724. Limonite—*Bog-iron Ore*—Teplitz, Bohemia, AUSTRIA.
725. Limonite—Paris, FRANCE.
726. Limonite or Clay Iron Ore—Paris, FRANCE.
727. Limonite—*Ochreous*—Rammelsberg, Hartz, GERMANY.
728. Limonite—Reims, FRANCE.
729. Limonite—Périgieux, FRANCE.
730. Limonite—*Actite*—Le Puy, Haute-Loire, FRANCE.

RED OCHRE.

Chemical Composition—Oxide of Iron, and more or less Water.

An uncrystalline earthy variety of Iron, often mixed with Clay. Colour, bright or dull red. Can generally be scratched with a knife.

Blackens when heated, but regains its red colour on cooling. With borax bead gives the indications of Iron. Abundant ore of Iron.

731. **Limonite**—*Red Ochre*—Copiapo, Chili, South America.

YELLOW OCHRE.

Chemical Composition—Oxide of Iron; Water.

Like the last, but of a brown-yellow or black colour. Earthy, fibrous, stalactitic. Scratched with a knife.

Blackens from the blow-pipe. With borax bead gives the indications of Iron. An abundant ore of Iron.

732. **Limonite**—*Yellow Ochre*—Goslar, Hartz, Germany.

CHALYBITE, CARBONATE OF IRON, SIDEROSE, or SPATHIC IRON.

Chemical Composition—Carbonic Acid, 379; Protoxide of Iron, 621.

In rhombohedrons; faces often curved. Usually massive, globular, fibrous, or encrusting. Light or dark brown. Glassy or pearly lustre. Streak white. Specific gravity, 3·7 to 3·9. Hardness, 3·5 to 4·5. Scratched with a knife.

Infusible. Blackens when heated. With borax bead gives the indications of Iron. Dissolves in nitric acid with effervescence when heated.

Occurs in beds and nodules in stratified rocks; in veins and cavities. It is often mixed with Clay (Clay Ironstone). Abundant Ore of Iron.

733. **Spathic Iron or Chalybite**—Lobenstein, Thuringia, Germany.
734. **Spathic Iron or Chalybite**—Neudorf, Hartz, Germany.
735. **Spathic Iron or Chalybite**—Tavistock, Devon, England.
736. **Spathic Iron or Chalybite**—Schwarzenberg, Saxony, Germany.
737. **Spathic Iron or Chalybite**—Allevard, Isère, France.
738. **Spathic Iron or Chalybite**—Baigorry, Pyrénées, France.
739. **Spathic Iron or Chalybite**—Rheinbreitbach, Prussia, Germany.
740. **Spathic Iron or Chalybite**—Zorge, Hartz, Germany.
741. **Spathic Iron or Chalybite**—Siegen, Prussia, Germany.
742. **Spathic Iron or Chalybite**—Baigorry, Pyrénées, France.
743. **Spathic Iron or Chalybite**—Dauphiné, France.
744. **Spathic Iron or Chalybite**—Eisenerz, Styria, Austria.

745. **Spathic Iron or Chalybite** — *With Copper Pyrites* — Cornwall, ENGLAND.

746. **Spathic Iron or Chalybite**— *On Anamesite*—Steinheim, Hesse, GERMANY.

747. **Spathic Iron or Chalybite**—*Spherosiderite*—Charleroi, BELGIUM.

748. **Spathic Iron or Chalybite**—Wieseck, Baden, GERMANY.

749. **Vivianite or Iron Earth**—*In calcinated Coal-measures*—Cransac, Aveyron, FRANCE.

750. **Vivianite**—Elbogen, Bohemia, AUSTRIA.

751. **Scorodite or Cupreous Arseniate of Iron**—St. Day, Cornwall, ENGLAND.

752. **Pharmacosiderite or Cube Ore**—St. Day, Cornwall, ENGLAND.

753. **Arseniosiderite**—Romanèche, near Mâçon, FRANCE.

754 & 755. **Lievrite, Yenite, or Ilvate**—Monte-Fico, near Rio, ELBA.

756. **Chalcodite and Quartz**—*On Hematite*—Antwerp, New York, U.S.

MANGANESE ORES.

Chemical Composition—Various Oxides of Manganese.

Crystallized or massive. Black. Lustre unmetallic; dull or shining. Powder or streak brown or black. Specific gravity, 4 to 5. Hardness generally below 3. Very easily scratched with a knife.

Infusible. With borax bead gives the characteristic indications of Manganese. Widely distributed. Used in chemical manufactures.

757. **Pyrolusite or Gray Ore of Manganese**—Siegen, Prussia, GERMANY.

758. **Pyrolusite or Gray Ore of Manganese** — Platten, Bohemia, AUSTRIA.

759. **Pyrolusite or Gray Ore of Manganese**—Ilefield, Hartz, GERMANY.

760. **Manganite or Acerdese**—Ilefeld, Hartz, GERMANY.

761. **Pyrolusite or Gray Ore of Manganese**—Ilemenau, Saxe-Weimar, GERMANY.

762. **Pyrolusite**—*Pseudomorphous variety*—Ilefeld, Hartz, GERMANY.

763. **Manganite or Acerdese**—Ilefeld, Hartz, GERMANY.

764. **Manganite or Acerdese**—Ilefeld, Hartz, GERMANY.

765. **Mangenite or Acerdese (Compact and Pyrolusite)**—*With Barytine*—Ilefeld, Hartz, GERMANY.

766. **Hausmannite (and Braunite), Black Manganese, Red Oxide of Manganese, or Braunstein**—Ilmenan, Saxe-Weimar, GERMANY.

767. **Psilomelane (Compact and Fibrous Manganese Ore) or Black Hematite**—Siegen, Prussia, GERMANY.

768. **Psilomelane**—Schneeberg, Saxony, GERMANY.

769. **Psilomelane**—Eibenstock, Saxony, GERMANY.

770. **Psilomelane**—Horhausen, Rhenish Prussia, GERMANY.

771. **Diallogite or Carbonate of Manganese**—Puebla, Mexico, NORTH AMERICA.

772. **Diallogite**—Freiberg, Saxony, GERMANY.

773. **Diallogite**—Kapnick, Hungary, AUSTRIA.

774. **Rhodonite, Manganese Spar, or Bisilicate of Manganese**—Freiberg, Saxony, GERMANY.

775. **Rhodontite**—Elbingerode, Hartz, GERMANY.

776. **Triplite, Ferruginous Phosphate of Manganese, or Pitchy Iron Ore**—Chanteloube, Limoges, FRANCE.

COBALT SECTION.

777. **Cobaltine, Silver-White Cobalt, or Glance Cobalt**—Tunaberg, near Nyköping, SWEDEN.

SMALTINE, GREY COBALT OR TIN-WHITE COBALT.

Chemical Composition.—Cobalt up to 24 per cent. Arsenic.

In octahedrons, cubes, dodecahedrons, and allied forms. Also massive. Tin-white or steel-grey. Lustre metallic. Streak greyish black. Fracture uneven. Specific gravity, 6·3 to 6·6. Hardness, 5·5.

Fusible. In the blow-pipe flame gives off arsenical fumes (odour of garlic). With borax bead gives the characteristic indications of Cobalt. In nitric acid forms a pink solution. Resembles Mispickel and Iron Pyrites, but is at once distinguished by the test with borax bead. Its Arsenical fumes distinguish it from Iron Pyrites, and its crystalline form from Mispickel.

Occurs in veins in Slate and Gneiss. A valuable ore of Cobalt.

778. **Smaltine, Grey Cobalt, Tin-white Cobalt, Binarseniet of Cobalt, or White Nickel**—Riechelsdorf, Hesse, GERMANY.

779. **Smaltine**—Schneeberg, Saxony, GERMANY.

780. **Smaltine**—*Argentiferous*—Schapbach, Baden, GERMANY.

781. **Smaltine**—*Black variety*—Challanches, Isère, FRANCE.

MISPICKEL OR ARSENICAL PYRITES.

Chemical Composition—Iron, 344; Arsenic, 196; Sulphur, 460.

In flattened prisms. Also massive. White. Lustre metallic. Streak grey. Fracture uneven. Specific gravity, 6·0 to 6·3. Hardness, 5·5. Cannot be scratched with a knife; scratched by quartz.

Heated before the blow-pipe it gives off white arsenical fumes, of garlic odour, and ultimately fuses into a black globule.

Abundant in mining districts. Sometimes auriferous.

This ore and Iron Pyrites form the "Mundic" of miners.

782. **Mispickel or Arsenical Cobalt**—Challanches, Isère, FRANCE.

783. **Black Oxide of Cobalt or Wad**—*On Limonite*—Challanches, Isère, FRANCE.

784. **Black Oxide of Cobalt or Wad**—*On Limonite*—Motu Mine, Missouri, U.S.

784a. **Black Oxide of Cobalt, Wad, or Asbolite**—Molong, New South Wales.

ARSENIATE OF COBALT, COBALT BLOOM, or ERYTHRINE.

Chemical Composition—Oxide of Cobalt, 376; Arsenic Acid, 384; Water, 240.

In oblique crystals, with a highly perfect cleavage like Mica. Also in incrustations. Red or pink, grey, green. Lustre brilliant, pearly. Transparent or opaque. Specific gravity, 2·9 to 3·1. Hardness, 1·5 to 2. Very easily cut with a knife.

Fusible in blow-pipe flame, evolving arsenical fumes. When heated on charcoal it gives off an odour of arsenic. With borax bead gives indication of Cobalt.

Occurs in beds and veins with other ores of Cobalt. A valuable ore of Cobalt.

785. **Erythrine or Cobalt Bloom**—*Crystallized variety*—Schwartz, Tyrol, Austria.

786. **Erythrine**—*Earthy variety*—Riechelsdorf, Hesse, Germany.

COPPER NICKEL or ARSENICAL NICKEL.

Chemical Composition—Nickel, 44; Arsenic, 56.

Usually in masses of a pale copper colour and metallic lustre. Specific gravity, 7·2 to 7·8. Hardness, 5 to 5·5. Scratched with a knife, using pressure.

Before the blow-pipe on charcoal melts, giving out white arsenical fumes having a garlic odour. It is readily distinguished by its pale copper red colour and its arsenical fumes when heated.

Occurs in veins in Granite and Slate, with ores of Cobalt, Silver, Copper, Bismuth, Lead. A valuable source of metallic Nickel.

787. **Nickeline, Arseniate of Nickel, or Copper Nickel**—Lostwithiel, Cornwall, England.

788. **Nickeline**—*With Mispickel and Nickel Ochre*—Challanches, France.

789. **Eisennickelkies**—Gladenbach, Hesse, Germany.

790. **Emerald Nickel**—*On Magnetite*—Texas, Pennsylvania, U.S.

ZINC SECTION.

SULPHURET OF ZINC or BLENDE.

Chemical Composition—Zinc, 667; Sulphur, 333.

In dodecahedrons, octahedrons, and allied forms. Also massive. Yellow, red, brown, black. Lustre adamantine, resinous, or waxy. Transparent or opaque. Breaks with brilliant cleavage faces in some directions. Specific gravity, 4·0 to 4·1. Hardness, 3·5 to 4·0. Easily scratched with a knife.

Infusible. Emits a strong light when heated, but no odour of sulphur is perceptible. It is easily distinguished by its waxy lustre, softness, infusibility, and perfect cleavage. It dissolves at once in nitric acid.

Occurs with Lead and Copper Ores. It is the "Blackjack" of miners. An ore of Zinc, but more difficult to smelt than the Carbonate and Silicate.

791. **Blende, Sulphuret of Zinc, or Blackjack**—*With Pyrites and Siderose*—Freiberg, Saxony, GERMANY.

792. **Blende**—Clausthal, Hartz, GERMANY.

793. **Blende**—Alston, Cumberland, ENGLAND.

794. **Blende**—*With Pearlspar*—Alston, Cumberland, ENGLAND.

795. **Blende**—Kapnick, Hungary, AUSTRIA.

796. **Blende**—Matlock, Derbyshire, ENGLAND.

797. **Blende**—*With Dolomite*—Schneeberg, Saxony, GERMANY.

798. **Blende**—*With Realgar and Quartz*—Kapnick, Hungary, AUSTRIA.

799. **Blende**—*Yellow variety*—Laffrey, Isère, FRANCE.

800. **Blende**—*With Pyrites and Quartz*—Cornwall, England.

801. **Blende**—*With Calcite*—Old Matlock, Derbyshire, England.

802. **Blende**—*With Galena*—Puebla, Mexico, NORTH AMERICA.

803. **Blende**—Bolivia, SOUTH AMERICA.

804. **Blende**—Bonn, Prussia, GERMANY.

805. **Blende**—Schwartzenberg, Saxony, GERMANY.

806. **Blende**—Frabach, Moselle, FRANCE.

806a–806c. **Blende**—Welcome Reef, NEW SOUTH WALES.

807. **Zincite or Ancramite**—*With Franklinite, Calcite, and Fowlerite*—Sterling, New Jersey, U.S.

808. **Willemite, Silicious Oxide of Zinc, or Anhydrous Silicate of Zinc**—*With Fibrous Calamine and Quartz Crystals*—The "Old Mountain," near Aachen, GERMANY.

CALAMINE, GALMEI, CARBONATE OF ZINC, OR ZINC SPAR.

Contains 52 per cent. of Zinc.

Usually in crusts or masses. White, green, or brown. Opaque. Pearly or glassy. Specific gravity, 4·1 to 4·5. Hardness, 5. Can be scratched with a knife, using a little pressure.

Infusible. On charcoal becomes yellow whilst hot, white on cooling. Dissolves rapidly with effervescence when heated with nitric acid.

Occurs with Galena and Blende. A valuable Zinc Ore.

809. **Calamine**—*Crystallized*—Near Aachen, Prussia, GERMANY.

810. **Calamine**—Alston, Cumberland, ENGLAND.

811. **Calamine**—*Cupriferous*—Drygill, near Keswick, Cumberland, ENGLAND.

812. Calamine—Santander, Spain.

813. Calamine—Santander, Spain.

814. Calamine—Lehigh County, Pennsylvania, U.S.

815. Calamine—*With Smithsonite*—Santander, Spain.

SMITHSONITE or SILICATE OF ZINC.

Contains 53 per cent. of Zinc.

In prisms or massive. White, greenish, bluish, or brownish. Glassy lustre. Transparent or opaque. Specific gravity, 3·3 to 3·5. Hardness, 5.

Infusible. Shines with a green light in the blow-pipe flame. Does not effervesce with nitric acid, but dissolves, leaving a jelly of Silica.

Occurs with Carbonate of Zinc. A valuable Zinc ore.

816. Smithsonite—Alston, Cumberland, England.

817. Smithsonite—Tamowitz, Silesia, Germany.

818. Smithsonite—Wiesloch, Baden, Germany.

819. Smithsonite—Wiesloch, Baden, Germany.

LEAD SECTION.

SULPHURET OF LEAD or GALENA.

Chemical Composition—Lead, 866; Sulphur, 134.

In cubes. Also granular, massive. Lead colour. Metallic lustre. Streak metallic. Breaks into cubical fragments, with bright cleavage faces. Specific gravity, 7·4 to 7·7. Hardness, 2·5. Very easily scratched with a knife.

Easily fusible. Before the blow-pipe on charcoal is reduced to a metallic globule of Lead, giving off an odour of burning Sulphur.

Occurs in Granite and stratified rocks. Often associated with Copper and other ores. It is the principal ore of Lead. It usually contains a small quantity of Silver.

820. Galena—*With Blende, Quartz, and Fluorine*—Alston, Cumberland, England.

821. Galena—*With Siderose and Quartz*—Neudorf, Hartz, Germany.

822. Galena—Matlock, Derbyshire, England.

823. Galena—Neudorf, Hartz, Germany.

824. Galena—Neudorf, Hartz, Germany.

825. Galena—*With Quartz*—Pontgiband, Auvergne, France.

826. Galena—*With Calcite*—Clausthal, Hartz, Germany.

827. Galena—*With Chalcopyrites*—Badenweiler, Baden, Germany.

828. Galena—Dauphiné, France.

829. Galena—Valais, Switzerland.

830. Galena—*Bleischimmer*—Clausthal, Germany.

831. Galena—*Miroir, Slickenside*—Matlock, Derbyshire, England.
832. Galena—*Blue Lead Ore, pseudomorphous*—Cornwall, England.
833. Galena—Przibram, Bohemia, Austria.
833a. Galena—Wellingrove, New England, New South Wales.
833b. Galena—*With Copper Pyrites*—Broadsound, Queensland.
833c. Galena—*Argentiferous*—Goulburn, New South Wales.
833d. Galena—*Argentiferous*—Braidwood, New South Wales.
833e. Galena—*Argentiferous*—Mine de Rosier, Puy de Dôme, France.
833f. Galena—*With Quartz and Heavyspar*—Queensland.

CERUSITE or CARBONATE OF LEAD.

Contains 77 per cent. of Lead.

In prisms, sometimes united in four or six rayed crosses. White or grey. Transparent or opaque. Lustre glassy. Specific gravity, 6·4 to 6·6. Hardness, 3·5.

Flies violently to pieces in the blow-pipe flame. If placed in a cavity on charcoal and covered with carbonate of soda, then carefully fused by the flame, it yields a globule of metallic Lead. In nitric acid it dissolves with effervescence.

Usually occurs with Galena. It is a valuable Lead ore.

834. Cerusite—*With Galena*—Mies, Bohemia, Austria.
835. Cerusite—Leadhill, Scotland.
836. Cerusite—*With Galena*—Siegen, Prussia, Germany.
837. Cerusite—*Massive, with Galena*—Clausthal, Hartz, Germany.
838. Cerusite—*With Quartz and Galena*—Mexico, North America.
839. Cerusite—*With Galena*—Matlock, Derbyshire, England.
840. Mimetesite or Mimetene, or Arsenate of Lead—*With Barytine*—Badenweiler, Baden, Germany.
841. Mimetene—Iohann-Georgenstadt, Saxony, Germany.

PYROMORPHITE or PHOSPHATE OF LEAD.

Chemical Composition—Oxide of Lead, 740; Phosphoric Acid, 158; Chloride of Lead, 102.

In stout prisms, grouped together. Also massive. Bright green or brown. Opaque or semi-transparent. Lustre resinous. Streak white. Fracture irregular. Specific gravity, 6·9 to 7·1. Hardness, 3·5 to 4·0. Easily scratched with a knife.

Easily fusible. With carbonate of soda on charcoal the Lead is reduced. Soluble in nitric acid.

Occurs sparingly in veins with Galena.

842. Pyromorphite—Keswick, Cumberland, England.
843. Pyromorphite—*With Black Manganese*—Keswick, Cumberland, England.

844. **Pyromorphite**—Keswick, Cumberland, England.
845. **Pyromorphite**—Cornwall, England.
846. **Pyromorphite**—Zschopau, Saxony, Germany.
847. **Pyromorphite**—Puebla, Mexico, North America.
848. **Pyromorphite**—*Brown*—Bleistadt, Bohemia, Austria.
849. **Pyromorphite**—Huelgoët, Bretagne, France.
850. **Pyromorphite**—*Brown*—Huelgoët, Bretagne, France.
851. **Pyromorphite**—*Brown*—Hornhausen, Rhenish Prussia, Germany.

ANGLESITE or SULPHATE OF LEAD.

Contains 68 per cent. of Lead.

In slender brilliant crystals, upon Galena. Also massive. White or grey. Transparent or opaque. Specific gravity, 6·3. Hardness, 3.

Before the blow-pipe fusible, but apt to decrepitate (fly to pieces); on charcoal, with carbonate of soda, yields a globule of metallic Lead. Differs from carbonate of lead in not dissolving with effervescence in nitric acid.

Usually occurs with Galena, and results from its decomposition.

852. **Anlgesite**—*With Limonite*—Anglesea, England.
853. **Anglesite**—*Cupriferous Linarite*—Keswick, Cumberland, England.
854. **Melinose**—Bleiberg, Corinthia, Austria.
855. **Chromate of Lead**—Miask, Ural, Russia.
856. **Tunsgate of Lead**—*On Greisen*—Altenberg, Saxony, Germany.

MERCURY SECTION.

CINNABAR or SULPHURET OF MERCURY.

Chemical Composition:—Mercury, 862; Sulphur, 138.

In granular, compact, and earthy masses. Sometimes in crystals, exhibiting adamantine cleavage faces. Opaque or semi-transparent. Vermilion or brownish red. Specific gravity, 8·0 to 8·2. Hardness, 2·5. Very easily scratched with a knife.

Before the blow-pipe it volatilizes, giving off a strong odour of burning Sulphur. Mixed with dried carbonate of soda, and heated over a candle-flame, in an iron spoon, it gives off vapours of Mercury, which may be condensed on a gold coin held half an inch above the mixture. The surface of the coin appears whitish at first, but, when rubbed between the fingers, becomes brilliantly amalgamated. With care, this test easily detects one per cent. of Cinnabar in an ore. The Mercury is removed from the gold coin by gentle heating. The blow-pipe tests distinguish it at once from Red Oxide of Iron and all other red Minerals.

Occurs in talcose and argillaceous rocks. It is the principal source of the Mercury of commerce.

Native Mercury, or Quicksilver, in a pure state is rarely found. It occurs disseminated in liquid globules through sandstone and other rocks, in cavities of which it may accumulate. It is easily recognized. A rock suspected to contain Mercury may be tested by simply heating it as described under Cinnabar, but without the addition of carbonate of soda.

857. **Cinnabar or Native Mercury**—Moschel, Palatinate, Germany.

858. **Cinnabar or Sulphuret of Mercury**—*Massive*—Almaden, Spain.

859. **Cinnabar or Sulphuret of Mercury**—Peru, South America.

860. **Cinnabar**—*On Coal*—Idria, Austria.

861. **Cinnabar**—Moschel, Palatinate, Germany.

861a. **Cinnabar**—from Mr. Bensusan's Mine—New South Wales.

861b. **Cinnabar**—Algiers, Africa.

SILVER SECTION.

SILVER.

In strings, plates, and branching forms penetrating Quartz, Porphyry, Slate, Granite. Silver white, but usually tarnished black. Malleable. Specific gravity, about 10·5. Hardness, 2·5 to 3.

Fusible, without giving off any odour. Soluble in nitric acid, and on adding salt to the solution, a white curd is thrown down which blackens on exposure to sunlight.

862. **Native Silver**—*With Sulphuret of Silver in Quartz*—Chanarcillo, Chili, South America.

863. **Silver**—*With Brown-spar, Quartz, &c.*—Chichas, near Potosi, South America.

864. **Argyrose, or Silver Glance, or Sulphuret of Silver**—*With Galena and Pyrites*—Schemnitz, Hungary, Austria.

865. **Argyrose, Silver Glance, or Sulphuret of Silver**—*With Galena, and Copper Pyrites*—Kuttenberg, Bohemia, AUSTRIA.

867. **Psaturose or Black Antimoneous Sulphuret of Silver**—*With Galena*—Freiberg, Saxony, GERMANY.

868. **Pyrargyrite Argyrithrose, Dark-red Silver Ore, Ruby Silver, or Black Silver**—Johann-Georgenstadt, Saxony, GERMANY.

869. **Pyrargyrite, or Red Silver**—Zacatocas, Mexico, NORTH AMERICA.

870. **Pyrargyrite, or Red Silver**—Freiberg, Saxony, GERMANY.

871. **Red Silver**—Freiberg, Saxony, GERMANY.

872. **Red Silver**—Braunsdorf, Saxony, GERMANY.

873. **Chlorobromid of Silver, or Embolite**—Chanarcillo, Atacama, Chili, SOUTH AMERICA.

874. **Very rich Silver Ore**—*With argentiferous Mispickel and Blende*—Aullagas, Bolivia, SOUTH AMERICA.

875. **Argentiferous Mispickel**—*In Quartz or Weisserz*—Freiberg, Saxony, GERMANY.

876. **Bournonite on Panabase**—*Very rich in Silver*—Cerro de Pasco, Peru, SOUTH AMERICA.

SULPHURET OF SILVER.

Chemical Composition:—Silver, 87; Sulphur, 13.

In dodecahedrons or allied forms. Also massive. Black. Opaque. Lustre, metallic. Streak, shining. Specific gravity, 7·2. Hardness, 2·0 to 2·5. Very easily cut with a knife.

Very fusible, giving off an odour of sulphur when heated. Before the blowpipe on Charcoal, with or without carbonate of soda, it yields a white globule of metallic Silver which can be flattened under a hammer.

The ore is soluble in nitric acid, and on adding salt to the solution a white curd is thrown down which blackens on exposure to sunlight.

Occurs in veins in Granite, Porphyry, and Slate, with Arsenic, Silver, and Lead ores.

876a. **Xanthoconite, or Sulphuret of Silver**—Mine de Rosier, Puy de Dôme, FRANCE.

GOLD SECTION.

GOLD.

In dust, grains, or nuggets, in river sand; or in wiry, branching, and irregular forms, in Quartz. Yellow, pale or deep. Malleable. Specific gravity, 15 to 19. Hardness, 2·5 to 3·0.

Fusible without blackening, and without giving off any odour. Imparts no colour to boiling nitric acid.

The minerals commonly accompanying Gold are Iron Pyrites, Arsenical Iron, Oxides of Iron and Maganese, Galena, and Copper Pyrites in Quartz veins; and Magnetic Iron, Titanic Iron, Chromic Iron, Tin Ore, Quartz, Zircon, Topaz, Corundum, Diamond, in alluvial deposits.

877. **Auriferous Pyrites**—*Disseminated in porphyritic rock*—Huasco, Chili, South America.

878. **Blende and Auriferous Pyrites**—Mine de Toro, Chili, South America.

878a. **Gold**—*In Quartz*—Adelong Creek, New South Wales.

878b. **Gold**—*On Sandstone*—From the Thames, New Zealand.

878c. **Gold**—*In Quartz*—280 *feet from the surface, average* 30 *ozs. per ton*—Adelong, New South Wales.

878d. **Gold**—*In Quartz*—White Horse Reef, Amherst, Victoria.

878e. **Auriferous Pyrites**—*In Quartz*—Adelong, New South Wales.

878f. **Sample of Alluvial Gold**—From the Great Northern Tin Mining Company's Claim—Oban, New England, New South Wales.

878g. **Gold**—Mr. T. Buckland's Claim.—Gympie, Queensland.

878h. **Model of a Nugget**—Victoria.

878i. **Model of the first large Nugget found in New South Wales**—Ophir Creek, New South Wales.

878k. **Model of a Nugget**—Victoria.

878l. **Model of a Nugget**—Victoria.

878m. **Auriferous Quartz**—New South Wales.

878n: **Gold**—*In Silex or Hornstone*—Morris Creek Company's Claim, New South Wales.

878o. **Auriferous Quartz**—Watt's Reef, Tamagulla, Perseverance Quartz Mining Company, New South Wales.

878p. **Auriferous Quartz**—North Star Claim, Energetic Reef, Lauriston, Victoria.

878q. **Auriferous Quartz**—Victoria.

878r. **Auriferous Quartz**—North Star Claim, Energetic Reef, Lauriston, Victoria.

878s. **Ironstone Cement**—*With Gold*—From Washdirt of the Turon River.

878t. **Auriferous Quartz**—From the Lucky Reef, Mount Pleasant, Victoria.

878u. **Auriferous Quartz**—From Dr. Tibbit's Reef, Dubbo, New South Wales.

878v. **Gold**—*In Calcite*—Gympie, Queensland.

878w. **Gold**—*In Calcite*—Try-again Reef, Messrs. Gordon, Roche, & Co's. Claim, Northern District, New South Wales.

878x. **Auriferous Quartz**—Stanley, Hurdle Flat, Victoria.

878y. **Auriferous Quartz**—Clunes, Victoria.

878z. **Auriferous Quartz**—Maryborough, Victoria.

878aa. **Auriferous Quartz**—Sandhurst, Victoria.

878bb. **Auriferous Quartz**—*With Galena and Pyrites*—Clunes, Victoria.

879. The following 42 examples of Alluvial Gold are accompanied by portions of the strata encountered in sinking for the precious metal. Sections of the Shafts, on a scale of 1 inch to a foot, are also exhibited. The Alluvial Gold Fields of the Colony are divided into three districts, and the localities where the Gold was obtained are arranged as follows:—

SOUTHERN DISTRICT.

No. 1. Erskine Flat.
Depth to wash-dirt, 24 feet.
„ of „ 14 „

No. 2. Wattle Flat.
Depth to wash-dirt, 9 feet.
„ of „ 2 „

No. 3. Sofala—Palmer's Oakey.
Depth to wash-dirt, 5 feet.
„ of „ 1 foot.

No. 4. Stony Creek.
Depth to wash-dirt, 16 feet.
„ of „ 4 „

No. 5. Ophir Creek.
Depth to wash-dirt, 20 feet.
„ of „ 1 foot.

No. 6. Bruce's Creek, Meroo River.
Depth to wash-dirt 17 feet.
„ of „ 1 foot.

No. 7. Windeyer—Clarke's Creek.
Depth to wash-dirt, 14 feet.
„ of „ 3 „

No. 8. Pipeclay Creek.
Depth to wash-dirt, 13 feet.
„ of „ 1 foot.

No. 9. Campbell's River.
Depth to wash-dirt, 7 feet.
„ of „ 2 „

No. 10. Little River.
Depth to wash-dirt, 9 feet.
„ of „ 1 foot.

SOUTHERN DISTRICT—*continued.*

No. 11. Native Dog Creek.
Depth to wash-dirt, 10 feet.
„ of „ 2 „

No. 12. Brisbane Valley.
Depth to wash-dirt, 13 feet.
„ of „ 1 foot.

No. 13. Tuena Creek.
Depth to wash-dirt, 12 feet.
„ of „ 2 „

No. 14. Pollock Gully.
Depth to wash-dirt, 6 feet.
„ of „ 3 „

No. 15. Rocky Plains.
Depth to wash-dirt, 8 feet.
„ of „ 2 „

No. 16. New Chum Hill.
Depth to wash-dirt, 40 feet.
„ of „ 5 „

No. 17. Snowy River—Kiandra.
Depth to wash-dirt, 18 feet.
„ of „ 31 „

No. 18. Braidwood—Major's Creek.
Depth to wash-dirt, 19 feet.
„ of „ 2 „

No. 19. Burrangong—Chance Gully.
Depth to wash-dirt, 39 feet.
„ of „ 3 „

No. 20. Burrangong—Lambing Flat.
Depth to wash-dirt, 18 feet.
„ of „ 2 „

NORTHERN DISTRICT.

No. 21. Nundle.
Depth to wash-dirt, 19 feet.
„ of „ 6 „

No. 22. Peel River.
Depth to wash-dirt, 4 feet.
„ of „ 1 foot.

NORTHERN DISTRICT—*continued.*

No. 23. Nundle—Hanging Rock.
Depth to wash-dirt, 15 feet.
„ of „ 5 „

No. 24. Rocky River.
Depth to wash-dirt, 45 feet.
„ of „ 1 foot.

No. 25. Pretty Gully (strata missing).

No. 26. Poverty Point.
Depth to wash-dirt, 7 feet.
„ of „ 2 „

No. 27. Euringar.
Depth to wash-dirt, 1 foot.
„ of „ 1 „

No. 28. M'Leod's Creek.
Depth to wash-dirt, 10 feet.
„ of „ 2 „

No. 29. Boonoo Boonoo.
Depth to wash-dirt, 5 feet.
„ of „ 1 foot.

WESTERN DISTRICT.

No. 30. Tambaroora—Golden Gully.
Depth to wash-dirt, 10 feet.
„ of „ 1 foot.

No. 31. Tambaroora—Dirthole Creek.
Depth to wash-dirt, 14 feet.
„ of „ 1 foot.

No. 32. Tambaroora—Bald Hills.
Depth to wash-dirt, 9 feet.
„ of „ 2 „

No. 33. Tambaroora—Lower Turon.
Depth to wash-dirt, 10 feet.
„ of „ 4 „

No. 34. Tambaroora—Lower Turon (2nd).
Depth to wash-dirt, 14 feet.
„ of „ 3 „

WESTERN DISTRICT—*continued.*

No. 35. Tambaroora—Macquarie River.

Depth to wash-dirt, 13 feet.
„ of „ 7 „

No. 36. Tambaroora—Pyramul Creek.

Depth to wash-dirt, 8 feet.
„ of „ 2 „

No. 37. Tambaroora—Junction of Turon and Macquarie.

Depth to wash-dirt, 7 feet.
„ of „ 1 foot.

No. 38. Windeyer—Meroo River.

Depth to wash-dirt, 7 feet.
„ of „ 1 foot.

No. 39. Stony Creek—Carcoar.

Depth to wash-dirt, 12 feet.
„ of „ 2 „

No. 40. Stony Creek—Menindie.

Depth to wash-dirt, 12 feet.
„ of „ 1 foot.

No. 41. Hargraves—Louisa Creek.

Depth to wash-dirt, 9 feet.
„ of „ 1 foot.

No. 42. Stony Creek.

Depth to wash-dirt, 7 feet.
„ of „ 5 „

TELLURIUM.

Hexagonal, in six-sided prisms, with basal edges replaced. Cleavage: lateral perfect, basal imperfect. Commonly massive and granular. Specific gravity, 6·1 to 6·3. Lustre, metallic. Colour and streak, tin-white. Brittle. Composition—Tellurium, 92·55; Iron, 7·20; and Gold, 0·25.

Native Tellurium occurs at the mine of Maria Loretto, near Zolothna in Transsylvania (whence the name sylvan and sylvanite), in sandstone, accompanying Quartz, Iron, Pyrites, and Gold. About forty years since it was found in considerable abundance, and was melted to extract the small quantity of Gold it contains.

880. **Tellurium**—Transsylvania, Austria.

PLATINUM SECTION.

PLATINUM.

In flattened or angular grains or nuggets, which are *malleable*. Steel-grey Lustre, metallic. Specific gravity, 17 to 19. As heavy as Gold, and therefore easily distinguished and separated from lighter materials.

Infusible. Insoluble in nitric acid.

Occurs in quartz veins, but principally in alluvial deposits with Gold. Used chiefly for philosophical apparatus. Of great value.

881. Platinum—Nischne-Tagilsk, Ural, Russia.

COPPER SECTION.

NATIVE COPPER.

Usually in strings, plates, or irregular masses; sometimes crystalline. Like ordinary Copper, but often tarnished. Specific gravity, 8·9. Easily scratched with a knife. Malleable (can be flattened out under a hammer).

Occurs with Copper ores.

881. Native Copper—New South Wales.

881a. Native Copper—New South Wales.

881b. Native Copper—Lake Superior, U.S.A.

882. Native Copper—Ural Mountains, Russia.

883. Native Copper—Aconcagua, Chili, South America.

883a. Native Copper—Peak Downs Copper Mining Company, Peak Downs, Queensland.

883b. Native Copper—Peak Downs, Queensland.

883c. Native Copper—Nischne-Tagilsk, Ural, Russia.

883d. Native Copper—*With Cuprite and Red Oxide of Copper, in Quartz*—New South Wales.

883e. Native Copper, and Red Oxide of Copper—Peabody Mine, New South Wales.

883f. Red Copper Ore, and Native Copper—Ophir Mine, Bathurst.

883g. Native Copper—Canobolas, Orange, New South Wales.

883h. Native Copper, and Red Oxide of Copper—Peabody Mine, New South Wales.

884. Native Copper—*In Limonite*—Nischne-Tagilsk, Ural Mountains, Russia.

885. Native Copper, and Cuprite—*On Hornstone*—Rheinbreitbach, Prussia, Germany.

RED OXIDE OF COPPER.

Chemical Composition:—Copper, 888; Oxygen, 112.

In octahedrons and dodecahedrons. Also in granular and earthy masses. Red. Lustre adamantine, metallic, or earthy. Streak red. Semi-transparent or opaque. Exhibits cleavage parallel with octahedral faces. Specific gravity, 6. Hardness, 3·5 to 4·0; can be scratched with a knife.

Before the blow-pipe on charcoal it yields a globule of metallic Copper. With borax bead gives the indications of Copper. Forms a blue solution in nitric acid. These tests distinguish it from Red Oxide of Iron.

Occurs in Granite and Slate, with Copper ores and Galena. Valuable source of the metal.

886. Red Oxide of Copper—Liskeard, Cornwall, England.

887. Red Oxide of Copper—Nischne-Tagilsk, Ural, Russia.

887a. Red Oxide—*With red and green Carbonate of Copper*—Cadiangulong Copper Mining Company, Orange, New South Wales.

887b. Red Oxide of Copper—*With green and blue Carbonate*—New South Wales.

887c. Red Oxide of Copper—*With green and blue Carbonate*—Wellington.

887d. Red and Black Oxide of Copper—*Partly converted into green and blue Carbonate*—New South Wales.

887e. Red and Black Oxide of Copper—Rockhampton, Queensland.

887f. Red Oxide of Copper—Gawarral, Queensland.

887g. Red Oxide of Copper—Queensland.

887h, i, k. Red Oxide of Copper and Native Copper—Cadiangulong, New South Wales.

887l. Red and Black Oxide—*With green Carbonate of Copper*—Queensland.

887m. Red Oxide—*With green Carbonate*—Cornwall, England.

TILE ORE.

A name applied to the earthy varieties of Red Copper, from its colour, which is usually brick-red or reddish brown. It consists of a red oxide of Copper, mixed with variable proportions of Hydrous Oxide of Iron or Limonite, and passes sometimes by the increase of the quantity of Iron into brown Ironstone. The red varieties contain the greatest amount of Copper, and the brown the greatest amount of Iron.

887n. Tile Ore—*With blue and green Carbonate*—New South Wales.

888. Tile Ore—*Cuprite*—Atacama, Chili, South America.

889. Red Oxide of Copper, or Cuprite—Huasco, Chili.

890. Chalcotrichite, or Red Oxide of Copper—Redruth, Cornwall, England.

COPPER GLANCE or VITREOUS COPPER.

Chemical Composition:—Copper, 798; Sulphur, 202.

Sometimes in prisms, but usually massive. Blackish lead grey, tarnished. Streak, metallic. Specific gravity, 5·5 to 5·8. Hardness, 2·5 to 3. Very easily scratched with a knife.

Fusible. Before the blow-pipe gives off an odour of Sulphur. When heated on charcoal, a malleable globule of metallic Copper remains, tarnished

black, but rendered evident on flattening under a hammer. With borax bead gives the indications of Copper. Dissolves in nitric acid, forming a blue solution. (These tests distinguish it from Sulphide of Silver.)

Occurs with other Copper ores. A valuable ore of Copper.

891. **Copper Glance, Chalcocite, Vitreous Copper, or Sulphuret of Copper**—*Cryst. var.*—Redruth, Cornwall, ENGLAND.

892. **Copper Glance**—Szaska, Banat, AUSTRIA.

893. **Copper Glance**—*Passing into Malachite*—Nischne-Tagilsk, Ural, RUSSIA.

ERUBESCITE OR PURPLE COPPER.

Cubical. The crystals are generally cubes, of which the solid angles are replaced, and the faces are mostly curvilinear.

Occurs both crystallized and massive. Colour of the latter, when recently fractured, between tombac-brown and copper-red, but it soon acquires an iridescent tarnish. Lustre, metallic. Streak, greyish-black, and somewhat shining. Slightly sectile. Easily frangible. Fracture, imperfect, conchoidal. Hardness, 3. Specific gravity, 4·4 to 5. Soluble in nitric acid.

894. **Erubescite, Purple Copper, or Variegated Copper**—Redruth, Cornwall, ENGLAND.

895. **Erubescite**—Tamaya, Chili, SOUTH AMERICA.

896. **Erubescite**—Monte Catine, ITALY.

897. **Erubescite**—Aconcagua, Chili, SOUTH AMERICA.

897a. **Erubescite**—NEW SOUTH WALES.

897b. **Erubescite**—*With Iron Pyrites*—Pioneer Quartz Crushing Company, Morinisk, QUEENSLAND.

898. **Erubescite**—*With Blende and Chalcopyrites*—Freiberg, Saxony, GERMANY.

COPPER PYRITES.

Chemical Composition:—Copper, 346; Iron, 305; Sulphur, 349.

In tetrahedrons or octahedrons. Usually massive. Brass yellow, often tarnished. Lustre, metallic. Streak, unmetallic, blackish green. Fracture, uneven. Specific gravity, 4·1 to 4·3. Hardness, 3·5 to 4·0. Easily scratched with a knife.

Fusible. Gives off an odour of Sulphur before blow-pipe. Does not give the indications of Copper with borax bead, or when heated upon charcoal with carbonate of soda. Dissolves in nitric acid, forming a blue solution. Distinguished from Iron Pyrites by being easily cut with a knife; and from Gold by not flattening under a hammer, and by its greenish powdery streak.

Occurs in Granite and Slate, in lodes or veins. Valuable ore of Copper.

899. **Chalcopyrites or Copper Pyrites**—*With Galena*—Siegen, Prussia, GERMANY.

900. **Copper Pyrites**—Freiberg, Saxony, GERMANY.

901. **Copper Pyrites**—Pyrences, Spain.

902 & 903. **Copper Pyrites**—Huasco, Chili, South America.

904. **Copper Pyrites.**—Kongsberg, Norway.

905. **Copper Pyrites.**—Redruth, England.

906. **Copper Pyrites**—Schwartzenberg, Saxony, Germany.

907. **Copper Pyrites**—Dillenburg, Nassau, Germany.

907a. **Copper Pyrites**—Canoblas Mountains, near Orange, New South Wales.

907b. **Copper Pyrites**—Bathurst, New South Wales.

907e, d, e, and f. **Copper Pyrites**—Canoblas, Orange, New South Wales.

907g. **Copper Pyrites**—Arendal, Norway.

907h. **Copper Pyrites**—Copper Hill, Molong, New South Wales.

907i. **Copper Pyrites**—*In Quartz*—Tungkitta Mine, Queensland.

907k. **Copper Pyrites**—Thomson River, Gippsland, Victoria.

PANABASE, GREY COPPER, or TETRAHEDRITE.

This term includes a variety of ores having a common crystalline form, generally the tetrahedron; also a definite chemical formula, though the ingredients are numerous and may be variously combined within certain limits. Sulphur is an invariable ingredient; and Arsenic or Antimony, one or both, must be present; the other ingredients are Copper, Iron, Zinc, Lead, Silver, or Mercury, in variable proportions. The Copper ranges up to 40 per cent.; and in some kinds as much as 30 per cent. of silver has been found. It also occurs massive. Steel grey to iron black. Lustre, metallic. Streak, black, or dark red when Zinc is present. Fracture uneven. Specific gravity, 4·5 to 5·2. Hardness, 3 to 4. Can be scratched with a knife.

Fusible. Before the blow-pipe gives off an odour of Sulphur, also white inodorous fumes of Antimony, and occasionally Arsenic.

Copper cannot be detected by the blow-pipe tests. It dissolves in nitric acid, forming a greenish brown solution.

Occurs with Copper Pyrites, Galena, and Blende. This ore is wrought for Copper, and occasionally for Silver.

908. **Grey Copper**—*With Blende, Galena, and Quartz*—Puebla, Mexico, North America.

909. **Grey Copper**—*With a coating of Copper Pyrites and with Galena*—Liskeard, Cornwall, England.

910. **Grey Copper**—*With Azurite*—Serravezza, Italy.

911. **Grey Copper**—*With Pyromorphite*—Katharinenburg, Ural, Russia.

912. **Grey Copper**—*With Dolomite and Quartz*—Isère, France.

912a. **Grey Copper**—*With Blue and White Flouorine*—Toscana, Italy.

912b. **Grey Copper**—Bathurst, New South Wales.

912c. **Grey Copper**—Croombit, New South Wales.

912d. **Grey Copper**—Thomson River, Gippsland, Victoria.

BOURNONITE.

Rhombic. Crystals often cruciform; also massive, granular, and compact. Colour and streak, steel grey inclining to dull lead grey, with a tinge of black. Opaque. Fracture uneven, or flat conchoidal, with a brilliant metallic lustre. Brittle, yields to the pressure of the nail. Hardness, 2·5 to 3. Specific gravity, 5·7 to 5·9.

Composition:—

Sulphur	19·76
Antimony	24·34
Lead	42·88
Copper	13·02
	100·00

913. **Bournonite or Wheel Ore**—*With Quartz*—Endellian, Cornwall, England.

BLUE COPPER or CHESSYLITE.

Primary form an oblique rhombic prism. Colour, azure blue passing into Berlin blue; in earthy varieties, smalt blue. Lustre, vitreous. Yields easily to the knife. Streak paler than the colour. Structure, lamellar. Brittle. Fracture, conchoidal. Hardness, 3·5 to 4·0. Specific gravity, 3·5 to 3·8. Composition: Oxide of Copper, Carbonic Acid, and Water. Chessylite is probably a result of the decomposition of other ores of Copper. It generally occurs lining cavities in primary and secondary rocks, and associated with Malachite and Red Copper. Chessylite forms a valuable ore of Copper when abundant.

914. **Blue Copper or Chessylite**—Chessy, Lyon, France.

915. **Blue Copper or Chessylite**—Coquimbo, Chili, South America.

915a to 915f. **Australian Blue Copper**—Cadiangulong, New South Wales.

BLACK OXIDE OF COPPER.

Heavy black powder or mass. Soft. Easily distinguished from Manganese by affording the indications of Copper by the blow-pipe tests. It results from the waste of various Copper ores. Valuable as a source of the metal.

915g. **Black Oxide of Copper**—Cadiangulong, New South Wales.

CARBONATES OF COPPER, BLUE AND GREEN.

Chemical Composition—Oxide of Copper, Carbonic Acid, Water; the percentage of metallic Copper about 56.

In crystals, but usually in fibrous, silky, globular, encrusting masses. Blue or green. Opaque. Glassy, silky, or dull. Specific gravity, 3·7 to 4·0. Hardness, 3·5 to 4·0; can be scratched with a knife.

Blacken when heated. On Charcoal are reduced to a globule of pure Copper. Give the indications of Copper with borax bead. Soluble in nitric acid with effervescence, forming a blue solution.

Silicate of Copper resembles the carbonate, and is distinguished by dissolving in nitric acid without effervescence.

Occur with Copper Ores, and result from their decomposition. Valuable sources of the metal.

916. **Malachite or Green Carbonate of Copper**—Chester County, Pennsylvania, U.S., AMERICA.

917. **Malachite or Green Carbonate of Copper**—Nischne-Tagilsk, Ural Mountains, RUSSIA.

918. **Malachite or Green Carbonate of Copper**—Schapbach, Baden, GERMANY.

919. **Malachite or Green Carbonate of Copper**—Dillenburg, Nassau, GERMANY.

920. **Malachite or Green Carbonate of Copper**—Choros, Chili, SOUTH AMERICA.

921. **Malachite, Green Carbonate of Copper, or Chrysocolla**—Huasco, Chili, SOUTH AMERICA.

922. **Malachite or Green Carbonate of Copper**—Redruth, Cornwall, ENGLAND.

923. **Malachite**—*In fossil Wood*—Tuscany, ITALY.

923a. **Malachite**—Three splendid blocks from the Peak Downs Company's Mine, Peak Downs, QUEENSLAND.

NOTE.—These specimens are exhibited in the centre room of the first floor, new wing.

923b. **Malachite**—Quedong, Bombala, NEW SOUTH WALES.

923c. **Malachite**—Burra Mine, SOUTH AUSTRALIA.

923d. **Malachite**—NEW SOUTH WALES.

923e. **Malachite**—NEW SOUTH WALES.

923f. **Malachite**—NEW SOUTH WALES.

923g. **Malachite**—Cadiangulong. NEW SOUTH WALES.

923h to n. **Blue and Green Malachite**—NEW SOUTH WALES.

924. **Pseudo-malachite, Phosphochalcite, Hydrous Phosphate of Copper**—Virneberg, near Rheinbreitenbach, GERMANY.

925. **Atacamite or Muriate of Copper**—Los Remolinos, Chili, SOUTH AMERICA. Occurs also in SOUTH AUSTRALIA.

926. **Olivenite or Olive Copper Ore**—Gwennap, Cornwall, ENGLAND.

927 & 928. **Chrysocolla, Copper Green, or Mountain Green**, ATACAMA, AND ACONCAGUA, Chili, SOUTH AMERICA.

929. **Chalcophyllite or Copper Mica**—Gwennap, Cornwall, ENGLAND.

930. **Clinoclasite, Aphanesite, or Cupreous Arseniate of Iron**—Gwennap, Cornwall, ENGLAND.

931. **Liroconite, Octahedral Arseniate of Copper, Linsenerz or Chalcophacite**—Gwennap, Cornwall, ENGLAND.

932. **Coquimbite or White Copperas**—Aconcagua, Chili, SOUTH AMERICA.

URANIUM SECTION.

933. **Uranite or Pitchblende**—Joachimstadt, Bohemia, AUSTRIA.

934. **Torbernite, Chalcocite Copper-Uranite, or Uranglimmer**—Johann-Georgenstadt, Saxony, GERMANY.

935. **Copper-Uranite**—Redruth, Cornwall, ENGLAND.

936. **Copper-Uranite, Lime-Uranite, or Phosphate of Uranium and Copper**—St. Symphorien, Autun, FRANCE.

BISMUTH SECTION.

BISMUTH.

Chemical Composition—Metallic Bismuth.

Sometimes crystallized in rhombohedrons closely resembling cubes, but generally massive. Lustre metallic. White, with a tinge of red, liable to to tarnish. Brittle. Specific gravity, 9·6 to 9·8. Hardness, 2·0 to 2·5. Easily scratched with a knife.

Easily fusible. Sometimes gives off an odour of garlic, owing to admixture of arsenic.

Occurs with Cobalt, Silver and Tin Ores, in Granite and Slate rocks. Bismuth is a very valuable metal.

937. **Bismuth or Wismuth**—Altenberg, Saxony, GERMANY.

938. **Bismuth or Wismuth**—*With Smalltine*—Schneeberg, Saxony, GERMANY.

939. **Bismuthine or Sulphuret of Bismuth**—*With Quartz*—Carrakfell, Cumberland, ENGLAND.

940. **Bismuthine or Sulphuret of Bismuth**—Redruth, Cornwall, ENGLAND.

TIN SECTION.

TIN ORE OR CASSITERITE.

Chemical Composition—Tin, 784; Oxygen, 216.

In four-faced prisms and pyramids, having an adamantine lustre. Also in masses and grains (Stream Tin); usually dull; sometimes resembling wood (Wood Tin). Semi-transparent or opaque. Brown or black; streak and powder pale brown. Fracture uneven. Specific gravity, 6·8 to 7·0. The great comparative weight is an important character to observe in distinguishing Tin Ore from other Minerals. Hardness, 6·0 to 7·0. Cannot be scratched with a knife, and may thus be distinguished from Blende, which it resembles in lustre and infusibility.

Infusible. When mixed in powder, with carbonate of soda, placed on charcoal and covered with a small piece of cyanide of potassium, and then heated in the blow-pipe flame, a malleable globule of metallic tin is obtained.

Occurs in veins, and disseminated in Granite, Schist, Slate, and Porphyry; and in alluvial deposits. It is a valuable ore, and the sole commercial source of the metal.

941. **Cassiterite, Tin Ore, Oxide of Tin, Peroxide of Tin, Tin Stone, Wood Tin, Stream Tin, Zinnerz and Etain Oxide**—Ehrenfriedmannsdorf, Saxony, GERMANY.

942. **Cassiterite or Tin Ore**—St. Agnes, Cornwall, ENGLAND.

943. **Cassiterite or Tin Ore**—Morbihan, FRANCE.

944. **Cassiterite or Tin Ore**—Altenberg, Saxony, GERMANY.

945. **Cassiterite or Tin Ore**—Schlaggenwald, Bohemia, AUSTRIA.

946. **Cassiterite or Tin Ore**—Zinnwald, Bohemia, AUSTRIA.

947. **Cassiterite or Tin Ore**—*Very large specimen of Stream Tin*—Cornwall, ENGLAND.

947a. **Wood Tin**—Bohemia, AUSTRIA.

947b. **Tin Ore**—Cornwall, ENGLAND.

947c. **Tin Ore**—Bohemia.

947d. **Tin Ore**—*Very rich lode*—FRANCE.

AUSTRALIAN TIN ORE.

FROM NEW SOUTH WALES.

1. TIN ORE OR CASSITERITE—*In Greisen*—Elsmore Mine, New England.
2. TIN ORE—*In surface Stone*—Elsmore Mine, New England.
3. TIN ORE—*Lode Tin*—Elsmore Mine, New England.
4. LODE TIN—Newstead Mine.
5. LODE TIN—Glen Lode Mining Co.
6. REEF TIN—Hall and Sturr's Lease, Tenthill, New England.
7. REEF TIN—Moore and Co.'s Lease, The Glen, New England.
8. REEF TIN—*In Quartz*—Tenterfield, New England.
9. REEF TIN—Cope's Creek, New England.
10. REEF TIN—*Surface Stone*—MacMaster's Lease, New England.
11. REEF TIN—Glen Innes, New England.
12. STREAM TIN—Brisbane Company, Quart-pot Creek, New England.
13. STREAM TIN—Silver Tin Company, Four-mile Creek, New England.
14. STREAM TIN—Tumut.
15. STREAM TIN—Queensland Company, New England.
16. STREAM TIN—Inverell Tin Mining Co., New England.

17. Stream Tin—Dumaresq's Mine, Mole River, New England.
18. Stream Tin—Inverell, New England.
19. Stream Tin—New Inverell, New England.
20. Stream Tin—Borolong, New England.
21. Stream Tin—Dundee River, New England.
22. Stream Tin—Oban, New England.
23. Lode Tin—*Washed*—Bagot and Clarke's Claim, Oban, New England.
24. Lode Tin—*As taken from the ground*—Bagot and Clarke's Claim, Oban, New England.
25. Tin Ore—Mr. Langley's Claim, New England.
26. Lode Tin—Mr. Bray's Claim, New England.
27. Stream Tin—Mole River, New England.
28. Stream Tin—Hogg's Creek, New England.
29. Stream Tin—Tumut.
30. Stream Tin—*Assay by Mr. Twemlow, 64 per cent.*—New England.

30a. Stream Tin—Horse-shoe Bend, Oban, New England.

31. Stream Tin and Gold—Mr. Bray's Claim, Oban River.
32. Stream Tin—Mr. Bambury's Claim, Ruby Creek, New England.
33. Stream Tin—Glen Lode Company's Claim, New England.
34. Stream Tin—*Assayed by Mr. Twemlow, 72 per cent. of Tin*—New England.
35. Stream Tin—*Assayed by Mr. Twemlow, 55 per cent.*—New England.
36. Tin Crystals—Elsmore Mine, New England.
37. Stream Tin—Mr. Henderson's Claim, Oban, New England.
38. Stream Tin—Mr. Love's Claim, Washpool, New England.
39. Stream Tin—Mr. Love's Claim, Skeleton Creek, New England.
40. Stream Tin—Elsmore Mine, New England.

FROM VICTORIA.

41. Stream Tin—Beechworth.
42. Stream Tin—Ovens.

RUTILE SECTION.

RUTILE.

Chemical Composition.—Titanium and Oxygen.

In crystals and masses. Red brown. Streak paler. Lustre submetallic, Hardness, 6·0 to 6·5. Specific gravity, 4·2 to 4·3.

Infusible. With borax bead, yellowish green or colourless (oxidizing), dirty violet (reducing).

948. **Rutile or Red Schorl**—*With Albite and Hornblende*—Pfitsch, Tyrol, Austria.

949. **Stannine, Sulphuret of Tin, Tin Pyrites, or Bell-metal Ore**—Redruth, Cornwall, England.

950. **Rutile**—*With Quartz*—St. Gotthard, Switzerland,

951. **Rutile**—*With Amphibole and Orthose*—Laurvig, Norway.

952. **Rutile or Saginite**—Valais, Switzerland.

953. **Rutile or Titanic Acid**—St. Yrieix, Haute Vienne, France.

954. **Octahedrite or Anatase**—Oisans, Isère, France.

TUNGSTATES.

WOLFRAMITE, TUNGSTATE OF IRON, or WOLFRAM.

Chemical Composition.—Tungstic Acid, Iron, Manganese.

Crystals or masses. Brownish black. Lustre shining or dull. Opaque. Hardness, 5·5. Specific gravity, 7 to 8.

Fusible with difficulty. With borax gives the colour of Iron. Characterized by its great weight. Found often with Tin ores.

955. **Wolfram, Tungstate of Iron, or Wolframite**—Zinnwald, Bohemia, Austria.

956. **Wolfram or Wolframite**—St. Leonard, Haute Vienne, France.

957. **Wolfram or Wolframite**—Altenberg, Saxony, Germany.

957a. **Wolfram**—New South Wales.

957b. **Wolfram**—Victoria.

958. **Scheelite, Scheelitine, or Tungstate of Lime**—*With Magnetite and Dolomite*—Traversella, Piedmont, Italy.

959. **Scheelite**—*On Greisen*—Altenberg, Saxony, Germany.

960. **Scheelite**—*With Quartz and Mica*—Zinnwald, Bohemia, Austria.

961. **Scheelite**—*With Wolfram*—Keswick, Cumberland, England.

962. **Scheelite**—Joachimsthal, Bohemia, Austria.

MOLYBDETES.

MOLYBDENITE.

Chemical Composition—Molybdenum 589, Sulphur 411.

In thin plates, like Graphite. Lustre metallic. Colour, lead grey. Specific gravity, 4·5 to 4·6. Hardness, 1·0 to 1·5. Easily scratched by the nail.

Infusible. Tinges blow-pipe flame faint green. Heated on charcoal for a long time, it gives off a faint sulphurous odour, and becomes encrusted white.

Occurs in Granite, Syenite, and Chlorite Schist. Not applied to any particular uses.

963. **Molybdenite or Sulphuret of Molybdena**—Altenberg, Saxony, GERMANY.

963a **Molybdenite**—New South Wales.

TANTALATES AND COLUMBATES.

964. **Columbite, Baierine, Columbate of Iron, or Niobite**—*In Granite*—Chanteloube, Haute Vienne, FRANCE.

965. **Niobite**—*In Orthose*—Middleton, Connecticut, U. S. A.

966. **Euxonite**—Tromöe, near Arendal, NORWAY.

967. **Polycrase**—*In Oligoclose*—Hitteroe, NORWAY.

968. **Pyrochlore**—*In Syenite*—Frederiksvärn, NORWAY.

969. **Polymignite**—*In Syenite*—Hunnerbacke, NORWAY.

ANTIMONY SECTION.

STIBNITE OR SULPHURET OF ANTIMONY.

Chemical Composition—Antimony 729, Sulphur 271.

Usually in long columnar or fibrous Crystal; also massive and granular. Lustre metallic. Lead colour. Often tarnished. Streak metallic. Specific gravity, 4·6 to 4·7. Hardness, 2. Very easily scratched with a knife.

Easily fusible. Before blow-pipe gives off white vapours and an odour of Sulphur, and is entirely volatilized. When the corner of a large piece of ore is fused, the border of the fused part is often tinted red. When heated on charcoal with cyanide of potassium, it gives a globule of Metallic Antimony, which is brittle, has a crystalline surface, burns when strongly heated, emitting white fumes, and can be entirely volatilized.

Occurs in veins in Granite and Slate alone, or with Ores of Silver, Lead, and other metals. This ore is the principal commercial source of the metal.

970. **Native Antimony**—Allemont, Isère, FRANCE.

971. **Stibnite or Sulphuret of Antimony**—Allemont, Isère, FRANCE.

972. **Stibnite or Sulphuret of Antimony** — Schemnitz, Hungary, AUSTRIA.

973. **Stibnite or Sulphuret of Antimony**—Siegen, Prussia, GERMANY.

974. **Stibnite**—*With Quartz*—Braunsdorf, Saxony, GERMANY.

975. **Stibnite**—*With Kermes*—Freiberg, Saxony, GERMANY.

976. **Stibnite**—Arnsberg, Prussia, GERMANY.

ANTIMONIAL AND ARSENICAL SILVER ORES.

Several ores of Silver contain Arsenic and Antimony, as well as Sulphur; the percentage of Silver in these ores varies from 12 to 68. Red, grey, or black. Lustre adamantine or metallic. Red streak. Specific gravity, 5 to 6. Hardness, 2 to 3. Easily scratched with a knife.

Fusible. Before the blowpipe give off an odour of sulphur, or arsenical fumes of a garlic odour, or fumes of antimony. Heated on charcoal with carbonate of soda afford a globule of metallic Silver.

Nitric acid extracts the Silver from these ores, forming a solution in which salt throws down a white curd, blackening on exposure to sunlight.

976a **Antimonial Arsenical Silver Ore**—Moruya, New South Wales.

SULPH-ARSENITES, &c.

977. **Heteromorphite or Feather-ore**—Wolfsberg, Hartz, Germany.

978. **Heteromorphite, Bleischimmer, or Jamesonite**—Endellion, Cornwall, England.

979. **Berthierite or Haidingerite**—Braunsdorf, Saxony, Germany.

OXIDE OF ANTIMONY.

980. **Kermesite, Red Antimony, or Rothspiessglanzerz**—Braunsdorf, Saxony, Germany.

HYDROUS ANTIMONATES.

981. **Bindheimite, Bleinerite, Antimonate of Lead, or Native Naples Yellow**—Endellion, Cornwall, England.

ARSENIC SECTION.

ARSENIC.

Chemical Composition—Metallic Arsenic.

Seldom distinctly crystallized. Usually in fine granular or spherical masses. Colour white, usually with a black tarnish. Streak white, metallic. Brittle. Specific gravity, 5·7 to 5·8. Hardness, 3·5.

Before the blow-pipe it quickly volatilizes without fusing, giving off white fumes having an odour of garlic.

Occurs in veins with Lead and Silver Ores.

982. **Arsenic**—*With Quartz*—Badenweiler, Baden, Germany.

983. **Arsenic**—*With Sœttersbergite*—Andreasberg, Hartz, Germany.

984. **Realgar or Red Sulphuret of Arsenic**—*On Calcite*—Andreasberg, Hartz, Germany.

SULPHUR SECTION.

SULPHUR.

Crystallized or massive. Yellow. Resinous lustre. Specific gravity, 2·1. Hardness, 1·5 to 2·5. Fusible. Burns with a blue flame and well-known odour. Occurs in volcanic regions, and in beds of Gypsum.

985. Native Sulphur—Girgenti, Sicily, Italy.

986. Native Sulphur—*With Calcite*—Girgenti, Sicily, Italy.

987. Native Sulphur—*With Gypsum*—Lüneburg, Hanover, Germany.

987a. Native Sulphur—Solfatara de Puzzoli, Italy.

987b. Native Sulphur—*White Island*—New Zealand.

CARBON SECTION.

GRAPHITE or BLACK LEAD.

Chemical Composition—Carbon.

In six-sided prisms; but usually in uncrystallized, wavy layers. Opaque. Black. Lustre metallic. Specific gravity, 2. Hardness, 1 to 2. Very easily cut with a knife. Has a greasy feel; marks paper like a lead pencil.

Infusible. Burns slowly away.

Molybdenite and Foliated Tellurium resemble Graphite; the former has a paler colour than Graphite, and the latter is very easily fusible.

Occurs in Gneiss and Slate. Valuable for lead pencils and crucibles.

989. Graphite, Black Lead, or Plumbago—Burrowdale, Cumberland, England.

990. Graphite, Black Lead, or Plumbago—Passau, Bavaria, Germany.

DIAMOND.

Chemical Composition—Carbon.

In octahedrons, tetrahedrons, dodecahedrons, and forms related to these; the faces of the crystal sometimes curved. Transparent. Colourless, yellow, red, green, blue, white, brown, or black. Lustre adamantine. Breaks with smooth cleavage planes parallel to the octahedral faces. Specific gravity, 3·5; loses 10-35ths of its weight in water. Hardness, 10. It is the hardest substance known, and scratches all other minerals and gems.

Infusible. It burns and is consumed at a high temperature.

990a. Diamond—Bingera, New South Wales.

COAL.

Coal is vegetable matter which has become mineralized by certain chemical changes which it has undergone, and by subsequent solidification by compression under the weight of the strata which have been accumulated above it since it was originally deposited. It appears to be composed of terrestrial and aquatic plants and trees (the decay of which probably reduced them to peat), which grew in a warm and moist climate of equable temperature, on the areas it now occupies, close to, or perhaps in, the margin of a shallow sea; and the clay (*Underclay*) with the roots of plants (*Stigmaria*, &c.) supporting each bed of coal, is the soil on which the vegetation grew of which it is formed. Each separate bed of coal, on this supposition, denotes the former existence of an adjoining surface of land, on the depression of which beneath a sea of moderate depth, the vegetable matter growing upon it became covered up by a deposit of sediment, which in its turn, by the further deposit of sediment and oscillation of level, supported a fresh growth of vegetation. In this manner, by a series of depressions of moderate amount, each bed of coal was formed in succession, while its interstratification with beds of limestone, shale, clay, sandstone and ironstone, indicates alternations of marine, estuary, and lagoon conditions. Although coal for the most part appears to have been formed in the above-mentioned manner, it is probable that other conditions may have occasionally prevailed, as for instance in the north of England and in the south of Russia, where some of the coal beds are stated to be apparently composed of the remains of broken and drifted plants carried into the sea by inundations, and the freshets of rivers.

Coal is composed of Carbon, Hydrogen, Nitrogen, Oxygen, Sulphur, and earthy matter or Ash in variable proportions. The greater the proportions of Carbon and Hydrogen the better is the coal, while sulphur and ash tend to render the coal both unpleasant to use and prejudicial in its effects, especially in the smelting of iron and steel.

Coals may be divided into two classes—bituminous, and non-bituminous or Anthracite. These change gradually, and merge one into the other, and in the South Wales coal-field the bituminous Coal passed into anthracite in a westerly direction. The conversion of the vegetable matter into coal was apparently produced by a kind of moist putrefaction, accompanied by the exclusion of all access of air. Under those circumstances the oxygen escaped in the form of carbonic acid, while the hydrogen being disengaged in the form of carburetted hydrogen, the carbon became in consequence more concentrated. In this manner, by the removal of all the hydrogen, bituminous coal becomes converted into anthracite. S.G. 1·20 to 1·59; mean S.G. of 31 samples 1·3.

*Analysis** from Graigola in S. Wales (S.G. 1·3.):—

Carbon	84·87
Hydrogen	3·84
Nitrogen	0·41
Sulphur	0·45
Oxygen	7·19
Ash	3·24
	100·00

Coke left by the Coal, 85·5 per cent.

* Report on the Coals suited to the Steam Navy, by Sir Henry T. De la Beche and Dr. Lyon Playfair; Memoirs of the Geological Survey of Great Britain, vol. ii, part 2.

The chief source of this valuable mineral in Australia is at present confined to the Colony of New South Wales, and a very fair collection of both Coal and Coal Fossils is on view in the centre room on the first floor of the new wing. About the Coal found in Victoria Mr. Selwyn, the late Director of the Geological Survey of that Colony, and at present Director-General of the Geological Survey of Canada, remarks:—"It is chiefly from these formations (absent in Victoria) that the richest and most valuable mineral products, viz., Coal, Iron, Copper, Silver, Lead, Salt, Mineral Oils, Marbles, &c., are obtained in large quantities; and thus, though nearly all the above and many others are known to occur in Victoria, few of them have been found in sufficient quantities to be profitably worked. This will probably be considered an unnecessary gloomy view to take respecting the mineral products of Victoria, but I think it useless to close our eyes to probable facts because they are unpleasant and perhaps not in accordance with our wishes and preconceived theories."—*Notes on the Physical Geography, Geology, and Mineralogy of Victoria; by Alfred R. C. Selwyn, Director of Geological Survey, and George H. F. Ulrich, Field Geologist.*

As to the age of the Cape Paterson Coal-field, the same eminent geologist remarks:—"I am inclined to believe that the Victorian 'Carbonaceous' series is newer than and above the Sydney Sandstone."—*Ib., p.* 20.

991. **Anthracite or Mineral Coal**—Schonefeld, Saxony, GERMANY.

992. **Anthracite or Mineral Coal**—Sable, Sarthe, FRANCE.

993. **Caking Coal or Pitch Coal**—Zwickau, Saxony, GERMANY.

994. **Mineral Coal or Cannel Coal**—Wigan, Lancashire, ENGLAND.

994a. **Mineral Coal**—*Large block showing the thickness of the seam* "EIGHT FEET IN HEIGHT"—From the Wallsend Company's Mine, Newcastle, NEW SOUTH WALES.

NOTE.—It is impossible to remove this specimen into its proper place. At present it is exhibited in front of the Museum, to the left of the entrance-gate.

994b. **Coal**—Cape Paterson, VICTORIA.

994c. **Lower Coal**—Tuggerah Beach, County Northumberland, NEW SOUTH WALES.

994d. **Top Coal**—Stony Creek, Bourne Russell, NEW SOUTH WALES.

994e. **Mineral Coal**—Black Creek, Hunter River, NEW SOUTH WALES.

994f. **Mineral Coal**—Deloraine, TASMANIA.

994g. **Coal**—*Upper seam, Telegraph seam*—Newcastle, NEW SOUTH WALES.

994h. **Coal**—*Second seam*—Burwood, NEW SOUTH WALES.

994i. **Coal**—Mangullia, County Bligh, NEW SOUTH WALES.

994k. **Coal**—Newcastle, NEW SOUTH WALES.

LIGNITE OR BROWN COAL.

Lignite (from *lignum*, wood.) Brown Coal, in which the form and woody structure of the original tree is preserved.

According to the recently published researches of Mons. M. E. Fremy, Lignite may be divided into two classes. 1st. *Lignite xyloïde et fibreux*, or

bois fossile, Lignite still displaying woody structure; and 2nd, *Lignite compacte et parfait*, or Lignite exhibiting the aspect and compactness of Coal.

The compact Lignites with the black and shining appearance of Coal are entirely soluble in alkaline hypochlorites, and are attacked by nitric acid with the greatest rapidity, producing a yellow resin. Lignite xyloïde and compact Lignite generally differ in the more combustible variety not being acted upon by concentrated potash; and M. Fremy has invariably observed that those Lignites which resist the action of potash are those which are derived from beds whose stratigraphical position most nearly approaches the true Coal Measures.

Lignites may, therefore, be distinguished, on the one hand, from mere wood by their complete solubility in nitric acid and in hypochlorites, and by the above-mentioned characters from Coals, which last are insoluble in hypochlorites, and are only slowly attacked by nitric acid.

The following are, according to M. Fremy, the degrees of alteration of woody tissue :—

1. *Turf* and *Peat*. Characterized by the presence of Ulmic Acid, and also by the woody fibres or the cellules of the medullary rays, which may be purified and extracted in notable quantity by means of nitric acid or hypochlorites, in which they are insoluble.

2. *Fossil Wood*, or *Woody Lignite*. This, like the preceding, is partially soluble in alkalies, but its alteration is more advanced, for it is nearly wholly dissolved by nitric acid and hypochlorites.

3. *Compact*, or *Perfect Lignite*. This substance is characterized by its complete solubility in hypochlorites and in nitric acid. Alkaline solutions do not in general act on perfect Lignite. Reagents in this variety show a passage of the organic matter into Coal.

4. *Coal*. Insoluble in alkaline solutions and hypochlorites.

5. *Anthracite*. An approximation to Graphite, resists the reagents which act on the above-mentioned combustibles, and is only acted upon by nitric acid with extreme slowness.

Analysis of Lignite, from Tasmania, by *C. Tookey* :—

Carbon	59·90
Hydrogen	4·66
Oxygen	15·99
Nitrogen	1·08
Sulphur	0·30
Ash	4·64
Water (hygroscopic)	13·43
	100·00

995. **Lignite or Brown Coal**—Meissner, Hesse, GERMANY.

996. **Lignite or Brown Coal**—Cologne, PRUSSIA.

996a. **Lignite or Brown Coal**—Lal Lal, VICTORIA.

996b. **Lignite or Brown Coal**—VICTORIA.

996c. **Lignite or Brown Coal**—VICTORIA.

996d. **Lignite or Brown Coal**—VICTORIA.

996e. **Lignite or Brown Coal**—VICTORIA.

DYSODYLE OR PAPER COAL.

In very thin leaves or folia, flexible, slightly elastic. Specific gravity, 1·14 to 1·25.

Very inflammable, burning with a bright flame and an odour like that of asafœtida, leaving an ash in the form of laminæ, consisting largely, as shown by Ehrenberg, of the silicious shells of Infusoria, especially of Naviculæ. Originally from Sicily, it is also found in New Zealand, and comes near the resiniferous shale called Tasmanite from Tasmania. The Tasmanian product is found on the Mersey, and is known to the colonists as Combustible Shale.

997. **Dysodile or Paper Coal**—New Zealand.

OIL SHALES.

The most common Oil-bearing rocks were originally the fine mud of deep or shallow seas: and the Limestones were the same, only the mud was calcareous in nature, like the coral mud of many a coral lagoon.

Professor Dana thinks that the Shales were derived from microscopic vegetable and infusorial animal life.

997a & 997b. **Two large blocks of Oil Shale** (in the centre hall of the first floor, new wing)—Hartley, NEW SOUTH WALES.

PETROLEUM GROUP.

998. **Elaterite or Mineral Caoutchouc.**

OXYGENATED HYDROCARBON COMPOUNDS.

AMBER, SUCCINITE, OR BERNSTEIN.

Amber is found in irregular masses, of all shades of yellow, from the palest primrose to the deepest orange—sometimes brown.

Composition—Carbon 78·96, hydrogen 10·52, oxygen 10·52.

Burns readily with a yellow flame, emitting an agreeable odour, and leaves a black shining light and carbonaceous residue. Becomes negatively electric by friction. Soluble in alcohol.

999. **Amber or Succinite**—Baltic Provinces, Prussia, GERMANY.

SALTS OF ORGANIC ACIDS.

1000. **Mellite or Honeystone**—Tula, RUSSIA.

CATALOGUE

OF THE

ROCK COLLECTION

IN THE

AUSTRALIAN MUSEUM.

INTRODUCTION.

CHARACTER OF ROCKS.

The several substances which form the materials of the earth's crust are termed rocks, the idea of a solid rocky substance not being necessarily implied. Thus, clay, shale, coal, certain iron ores, and even ice and guano, come under the designation of rocks, because they form occasionally a considerable portion of the earth's surface.

All rocks are mineral aggregates consisting of minute mineral parts more or less solid and cemented together. Under the term "mineral" all mineralized remains of organic bodies are included.

Composite rocks consist of two or more different minerals like granite; simple rocks of one mineral only, like limestone, for example.

Subordinate ingredients are called accessory or non-essential.

The chief object for the student of Lithology is to determine the minerals of which a given rock consists; this may be done by microscopic analysis, magnetic analysis, and chemical analysis. A simple lens will often render great service, and a microscope is better still. Delicate investigations require however complicated apparatus and demand time, and they are out of the question for the field geologist.

The number of the principal minerals which enter into the composition of rocks are small, and are classed as follows:—Felspar, quartz, mica, hornblende (amphibole), pyroxene (augite), calcspar, and dolomite.

The following occur less frequently:—Chlorite, talc, leucite, nephiline, olivine, tourmaline, garnet, gypsum, coal, some sulphurets, and some iron ores.

The number of accessories is of course very much greater, and every known mineral may occur in this manner.

It is well known that the presence of one mineral often denotes the neighbourhood of another, and that the presence of certain minerals forbids the presence of certain others.

Minerals usually associated.—Quartz and mica, orthoclase, quartz and mica, orthoclase and oligoclase, labradorite and augite; orthoclase or oligoclase and hornblende, hornblende and epidote.

Minerals not found together.—Quartz and augite, and perhaps labradorite and hornblende.

The arrangement of the collection is, according to Bernhard von Cotta, in the following order:—

ROCK SERIES.

I.—Igneous Rocks, or Eruptive Rocks—all of which are most probably products of igneous fusion.

Volcanic.

(Ejected in a fluid or viscous state.)

Plutonic.

(Solidified deep down in the earth.)

A. Rocks poor in silica, or basic rocks.

(*a*) Volcanic, of which the basalts are the principal representatives.

(*b*) Plutonic. Of these the principal representatives are the so-called *greenstones* (diabase, diorite, &c.)

B. Rocks rich in silica, or acidic rocks.
   (*a*) Volcanic, *e.g.* the trachites.
   (*b*) Plutonic, *e.g.* the granites.

II.—Metamorphic Crystalline Schists—Most probably the product of transmutation of sedimentary rocks, but in respect of their mineralogical composition closely allied to the igneous, *e.g.*, gneiss, mica schist, chlorite schist, &c.

III.—Sedimentary Rocks—The products of deposit—
1. *Argillaceous rocks*, such as clay and argillaceous shale.
2. *Limestone rocks*, such as limestone and dolomite (including gypsum and anhydrite).
3. *Siliceous rocks*, *e.g.*, sandstones and conglomerates.
4. *Tufa formations.*

IV.—Rocks of less frequent occurrence, which only form subordinate strata or separate beds, and whose origin is in part still doubtful, without attempting in their case a logical classification :—
1. *Carbonaceous rocks.*
2. *Ironstone.*
3. *Serpentine.*

V.—Rocks essentially composed of one mineral, such as quartz, opal, &c.

SPECIMENS OF ROCKS.

BASIC IGNEOUS ROCKS.

VOLCANIC SERIES.

(Ejected in a fluid or viscous state, and cooled near the surface.)

BASALTIC ROCKS.

BASALT.

1. Granular Basalt or Dolerite—Löwenburg, Seven Mountains, GERMANY.
2. Granular Basalt—Löwenburg, Seven Mountains, GERMANY.
3. Nephelinite or Basalt—Lobau, Saxony, GERMANY.
4. Nephelinite or Basalt—Tichlowitz, Tetschen, Bohemia, AUSTRIA.
5. Dolerite Wacke—*Altered Basalt*—Bilin, Bohemia, AUSTRIA.
6. Nephelinite or Basalt—Lobau, Saxony, GERMANY.
7. Basalt—Minderberg, Rhine, GERMANY.
8. Basalt—Geising, SAXONY.
9. Basalt—*Vesicular*—Oberwinter, Rhine, GERMANY.
10. Basalt—*Vesicular*—Seven Mountains, GERMANY.
11. Basalt—Geissingen, Saxony, GERMANY.
12. Basalt—Minderberg, Rhine, GERMANY.
13. Basalt—*Vesicular*—Rauchloch, on the Rhine, GERMANY.
14. Basalt—*Australian*—Bald Hill, Nandewar Range, Liverpool Plains, NEW SOUTH WALES.
15. Basalt—Kiama, NEW SOUTH WALES.
16. Basalt—Jones' Station, Barraba Creek, County Darling, NEW SOUTH WALES.
17. Basalt—*Amygdaloidal*—Copper Hill, County Wellington, NEW SOUTH WALES.

TRAP OR ANAMESITE.

18. Trap—*Vesicular*—"The Rock," Namoi River.
19. Trap—*Vesicular (with Pea Iron-Ore)*—Head of Bibula Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
20. Trap—*Amygdaloidal*—Ranges west of Tarangari, County Pottinger, NEW SOUTH WALES.
21. Trap—Near Dirrah, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
22. Trap—*Vesicular*—East of Berrigal, Nandawar Range, Liverpool Plains District, NEW SOUTH WALES.
23. Trap—Parish of Lindsay, NEW SOUTH WALES.
24. Trap—Wambra Creek, N.S.W or QUEENSLAND (?).
25. Trap—*Amygdaloidal*—Emu Creek, Darling Downs, QUEENSLAND.
26. Trap—Ranges south of Dirrah, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
27. Trap—*Amygdaloidal*—Mud-Volcano, Uyliomel, Keewong Creek, County Gowan, Bligh District, NEW SOUTH WALES.
28. Trap—*Amygdaloidal*—North-east of Terryhihie Creek, NEW SOUTH WALES (?)
29. Trap—*Débris*—One mile from Rocky Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
30. Trap—*Débris*—Rocky Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
31. Trap—*Débris, containing fragments of Granite*—Rocky Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
32. Trap—Eastern slopes of Dividing Range, Darling Downs, QUEENSLAND.
33. Trap—*Porphyritic*—Terrypulue Creek, NEW SOUTH WALES.
34. Trap—Bodangora, NEW SOUTH WALES.
35. Trap—*Amygdaloidal*—Waa, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
36. Trap—*Porphyritic*—Near Bowra, NEW SOUTH WALES.
37. Trap—*Amygdaloidal*—Hodgson's Creek.
38. Trap—Bungaboomal Creek, County Lincoln, NEW SOUTH WALES.
39. Trap—*Vesicular*—Waa, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
40. Trap—*Amygdaloidal*—"The Rock," Namoi River.
41. Trap—Ranges west of Dirrah, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
42. Trap—Eastern slopes of Dividing Range, Darling Downs, QUEENSLAND.

43. Trap—Dirrah, Nandawar Range, Liverpool Plains, New South Wales.
44. Trap—Western slopes of Dividing Range, Darling Downs, Queensland.
45 & 46. Duplicates of the same.

PLUTONIC SERIES.

(Solidified deep down in the earth.)

DIABASE, HYPERITE, SCANDINAVIAN TRAP.

Diabas (*Germ.*) Diabase (*Fr.*)

47. Diabase—Ternuay, Haute-Saône, France.
48. Diabase—Lauterthal, Hartz, Germany.
49. Diabase—*Porphyritic*—Lachwetre, Haute-Saône, France.
50. Diabase—*Porphyritic*—Masseveaux, Upper Rhine, Germany.
51. Augite Rock—*Lherzolite*—Lake of Lherz, Pyrenees, Spain (?).
52. Augite Rock—*Lherzolite*—Lake of Lherz, Pyrenees, Spain (?).
53. Augite—*Coccolite*—Bidywiandi, Namoi River, New South Wales.

GABBRO, EUPHOTIDE, or DIALLAGE ROCK.

Gabbro (*German and French*).

53a. Gabbro—Tuscany, Italy.
54. Gabbro—Odren, Upper Rhine, Germany.
55. Gabbro—Ilsenburg, Hartz, Germany.
56. Gabbro—Odren, Upper Rhine, Germany.

DIORITE or GREENSTONE.

Diorit (*Germ.*) Diorite (*Fr.*)

58. Diorite—*Syenitic*—Château Lambert, Haute Saône, France.
59. Diorite—Haslau, Saxony, Germany.
60. Diorite—*Granitic*—Oberbruch, Vosges, Germany.
61. Diorite—*Porphyritic*—Servance, Haute-Saône, France.
62. Diorite—*Granitic*—Ballon de St. Maurice, France.
63. Diorite—*Granitic*—Biarville, Vosges, Germany.
64. Diorite—Saymont, Valdajol, France.
65. Diorite—*Napoleonite*—Corsica, France.
66. Diorite—Sault, Vosges, Germany.
67. Diorite—Hasslau, Saxony, Germany.
68. Diorite—St. Maurice, Vosges, France.

69. **Diorite**—Lobau, Saxony, GERMANY.
70. **Diorite**—Lobau, Saxony, GERMANY.
71. **Diorite**—*Dioritine*—Rupt, Vosges, FRANCE.
72. **Diorite**—Hasslau, Saxony, GERMANY.
73. **Diorite**—NEW SOUTH WALES.
74. **Diorite**—Near Mount Tom, Port Curtis, QUEENSLAND.
75. **Diorite**—Bed of Caliope River, QUEENSLAND.
76. **Diorite**—King's Plains, NEW SOUTH WALES.
77. **Diorite**—Horton River, near Eulowrie, Gwydir District, NEW SOUTH WALES.
78. **Diorite**—County Gordon, NEW SOUTH WALES.

APHANITE.

Aphanit (*Germ.*) Aphanite (*Fr.*)

78a. **Aphanite**—Berggiesscheibel, Saxony, GERMANY.
78b. **Aphanite**—*Variolitic or Variolite*—Durance, FRANCE.

MELAPHYRE.

Melaphyr (*Germ.*) Melaphyre (*Fr.*)

79. **Melaphyre**—Vale of Masseveaux, FRANCE.
80. **Melaphyre**—Vale of Masseveaux, FRANCE.
81. **Trap**—*On Melaphyre*—Raoul l'Etape, Vosges, FRANCE.
82. **Melaphyre**—Plauenscher Grund, Saxony, GERMANY.
83. **Melaphyre**—Mohorn, Saxony, GERMANY.
84. **Melaphyre**—Plauen, Saxony, GERMANY.
85. **Melaphyre**—Potschappel, Saxony, GERMANY.
86. **Melaphyre**—Potschappel, Saxony, GERMANY.
87. **Melaphyre**—Plaunitz, Saxony, GERMANY.
88. **Melaphyre**—Potschappel, Saxony, GERMANY.
89. **Metaphyre**—*Trap*—Le Puix, Upper Rhine, GERMANY.
90. **Melaphyre**—*Trap*—Bussang, Vosges, FRANCE.
91. **Melaphyre**—*Trap*—Herbruch, Upper Rhine, GERMANY.
92. **Melaphyre**—*Trap*—St. Maurice, Vosges, FRANCE.
93. **Melaphyre**—*Trap*—Mohorn, Saxony, GERMANY.
94. **Melaphyre**—*Vesicular*—Potschappel, Saxony, GERMANY.
95. **Melaphyre**—*Vesicular*—Planitz, Saxony, GERMANY.
96. **Melaphyre**—St. Dié, Vosges, FRANCE.

PORPHYRITES.

PORPHYRITE, FELSPAR PORPHYRY, QUARTZLESS PORPHYRIES, MICA PORPHYRY, OR HORNBLENDE PORPHYRY.

Porphyrit (*Germ.*) Porphyrite (*Fr.*)

97. **Felspar Porphyry**—Altenberg, Saxony, GERMANY.
98. **Porphyry**—Bärenkopf, Upper Rhine, GERMANY.
99. **Porphyry**—Bärenkopf, Upper Rhine, GERMANY.
100. **Felspar Porphyry**—Geising, Saxony, GERMANY.
101. **Felspar Porphyry**—Altenberg, Saxony.
102. **Felspar Porphyry**—Braunsdorf, Saxony, GERMANY.
103. **Green Porphyry**—Lessines, BELGIUM.
104. **Green Porphyry**—Lessines, BELGIUM.
105.* **Green Porphyry**—Plancher les Mines, Haute-Saône, FRANCE.

* The last three numbers are, probably, more correctly arranged with the Diorite or Greenstone.

MICA TRAP ROCKS.

106. **Minette**—*Coarse-grained*—Schirmeck, Vosges, GERMANY.
107. **Minette**—*Fine-grained*—St. Etienne, Vosges, GERMANY.
108. **Minette**—*Micaceous and porphyritic*—Vachembach, Vosges, GERMANY.
109. **Minette**—*Micaceous*—St. Maurice, Vosges, GERMANY.
110. **Kersantite**—*A variety of Mica Trap*—Kersanton (*Fr. and German*)—Wiesenbach, Vosges, GERMANY.
111. **Kersantite**—St. Marie aux Mines, Rhine, GERMANY.

SYENITE GROUP.

SYENITE.

Syenit (*Germ.*) Syénite (*Fr.*)

112. **Syenite**—*Granitic*—Plauenscher Grund, Saxony, GERMANY.
113. **Syenite**—*Granitic*—Zitschwig, Saxony, GERMANY.
114. **Syenite**—*Albitic*—Bernsdorf, Saxony, GERMANY.
115. **Syenite**—*Granitic*—Dresden, Saxony, GERMANY.
116. **Syenite**—*Granitic*—Ballon de Servance, Vosges, FRANCE.
117. **Syenite**—*Granitic*—Ballon de Giromanguy, Vosges, FRANCE.
118. **Syenite**—*Dioritic*—Zitschwig, Saxony, GERMANY.
119. **Syenite**—Port Curtis, QUEENSLAND.
120. **Syenite**—Coombing Creek, County Bathurst, NEW SOUTH WALES.

121. **Syenite**—Bidleyana, Kitu or Kito Creek, Warrego District, New South Wales.
122. **Syenite**—Bibolla Creek, Nandawar Range, Liverpool Plains, New South Wales.
123. **Syenite**—Coombing Creek, County Bathurst, New South Wales.
124. **Syenite**—Bingara, County Murchison, New South Wales.

ACIDIC IGNEOUS ROCKS.

VOLCANIC SERIES.

TRACHYTE GROUP.

TRACHYTE.

Trachyt (*Germ.*) Trachyte (*Fr.*)

125. **Trachyte**—Stenzelberg, Rhenish Prussia, Germany.
126. **Trachyte**—Stenzelberg, Rhenish Prussia, Germany.
127. **Trachyte**—Rosenau, Seven Mountains, Germany.
128. **Trachyte**—Berkum, Seven Mountains, Germany.
129. **Trachyte**—Wolkenburg, Seven Mountains, Germany.
130. **Trachyte**—Löwenburg, Seven Mountains, Germany.
131. **Trachyte**—Margarethenkreuz, on the Rhine, Germany.
132. **Trachyte**—Campagna of Rome, Italy.
133. **Trachyte-Dolorite**—Breiberg, Seven Mountains, Germany.
134. **Trachyte**—Stenzelberg, Rhenish Prussia, Germany.
135. **Trachyte**—Vogelskau, on the Rhine, Germany.
136. **Trachyte**—Mittelberg, on the Rhine, Germany.
137. **Trachyte**—Margarethenkreuz, on the Rhine, Germany.
138. **Domite**—*Variety of Trachyte*—Le Puy-de-Dôme, France.
139. **Domite**—*Variety of Trachyte*—Le Puy-de-Dôme, France.
140. **Sanidinophyre**—*Variety of Trachyte*—Klein Rosenau, Seven Mountains, Germany.
141. **Sanidinophyre**—*Variety of Trachyte*—Klein Rosenau, Seven Mountains, Germany.
142. **Tephrine**—*Variety of Trachyte*—Wolwick, Puy-de-Dôme, France.
143. **Tephrine**—*Variety of Trachyte*—Wolwick, Puy-de-Dôme, France.

OBSIDIAN AND PUMICE-STONE.

Obsidian und Bimstein (*Germ.*) Obsidian et Ponce (*Fr.*)

144. **Pumice-stone**—Hodgson's Creek, Darling Downs, QUEENSLAND.
145. **Obsidian or Volcanic Glass**—Lipary, Sicily, ITALY.

PHONOLITE GROUP.

PHONOLITE OR CLINKSTONE.

Phonolith, Klingstein, Porphyr Schiefer (*Germ.*) Phonolithe (*Fr.*)

146. **Phonolite**—Kühlsbrunnen, Seven Mountains, GERMANY.
147. **Phonolite**—Aussig, Saxony, GERMANY.

PLUTONIC SERIES.

GRANITIC GROUP.

GRANITE.

Granit (*Germ.*) Granite (*Fr.*)

148. **Granite**—*Var. Protogyne*—Mont Blanc, Savoy.
149. **Granite**—Bobritz, near Freiberg, GERMANY.
150. **Granite**—Keilbusch, near Meissen, Saxony, GERMANY.
151. **Granite**—Zscheila, near Meissen, Saxony, GERMANY.
152. **Granite**—Lockwitz, Saxony, GERMANY.
153. **Granite**—Cherbourg, FRANCE.
154. **Granite**—*Quartziferous*—Raoul l'Etape, Vosges, FRANCE.
155. **Granite**—Gerardmer, Vosges, FRANCE.
156. **Granite**—*With two kinds of Mica*—Bonvacote, Vosges, FRANCE.
157. **Granite**—Baveno, Lombardy, ITALY.
158. **Granite**—*Porphyritic*—Rémirement, Vosges, FRANCE.
159. **Granite**—*Porphyritic*—Gerardmer, Vosges, FRANCE.
160. **Granite**—*Porphyritic*—Bonvacote, Vosges, FRANCE.
161. **Granite**—*Porphyritic*—Rupt, Vosges, FRANCE.
162. **Granite**—*Porphyritic*—Bonvacote, Vosges, FRANCE.
163. **Granite**—*Porphyritic*—Lubresse, Vosges, FRANCE.
164. **Granite**—*Micaceous*—Rochesson, Vosges, FRANCE.
165. **Granite**—*Micaceous*—Lepange, Vosges, FRANCE.

166. Granite—*Porphyritic, in contact with Schiste*—Felleringen, Upper Rhine, GERMANY.
167. Granite—Alençon, FRANCE.
168. Granite—Lockwitz, Saxony, GERMANY.
169. Granite—St. Etienne, Vosges, FRANCE.
170. Granite—*With Pyrites*—St. Nabord, Vosges, FRANCE.
171. Granite—*Micaceous*—Cletcy, Vosges, FRANCE.
172. Granite—*Porphyritic*—Bass, near Rupt, Vosges, FRANCE.
173. Granite—*Var. Pegmatite or Graphic Granite*—Plauenscher Grund, Saxony, GERMANY.
174. Granite—*Var. Pegmatite or Graphic Granite*—Vale of Grange, Vosges, FRANCE.
175. Granite—*Var. Pegmatite*—St. Nabord, Vosges, FRANCE.
176. Granite—Merutherer, County Bligh, NEW SOUTH WALES.
177. Granite—Sappa Bulgar, County Gordon, NEW SOUTH WALES.
178. Granite—Mary Smoker's Creek, Stanley River, NEW SOUTH WALES or QUEENSLAND (?).
179. Granite—Teromco, Cooyal Creek, County Phillip, NEW SOUTH WALES.
180. Granite—Molong, NEW SOUTH WALES.
181. Granite—QUEENSLAND.
182. Granite—Prince William, York, NEW SOUTH WALES (?).
183. Granite—Wallah, Burnet River, QUEENSLAND.
184. Porphyritic Granite—NEW SOUTH WALES.
185. Granite—Near Durandar, Hanley River, NEW SOUTH WALES (?).
186. Granite—Narrawambong, Wialdra, County Bligh, NEW SOUTH WALES.
187. Granite—Baffle Creek, 30 miles north-west of Rosedale, Port Curtis Road, QUEENSLAND.
188. Granite—Toromco, Tooyal Creek. NEW SOUTH WALES (?).
189. Granite—Rocky Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
190. Granite—Between King's Plains and Carcoar, NEW SOUTH WALES.
191. Granite—Rocky Creek, Nandawar Range, Liverpool Plains, NEW SOUTH WALES.
192. Granite—Seven miles west from Wallah, Burnet River, QUEENSLAND.
193. Granite—Fourteen miles from Coolah South, County Bligh.
194. Granite—*With glossy Felspar*—Tonduran, Warrambangles. County Bligh, NEW SOUTH WALES.
195. Granite—Rocky Creek, Nandawar Range, NEW SOUTH WALES.
196. Granite—County Bligh, NEW SOUTH WALES.

197. Granite—Narrawambong, Wialdra, County Bligh, New South Wales.
198. Granite—Caboulture River, New South Wales or Queensland (?).
199. Granite—Nunbagong, Sappa Bulgar, County Murray, New South Wales.
200. Granite—Scrubby Creek, Stanley Creek, New South Wales.
201. Granite—Mary Smoker's Creek, Stanley River, New South Wales.
202. Granite—Numbagong, Sappa Bulgar, County Gordon (?), New South Wales.
203. Granite—Teromeo, Cooyal Creek, New South Wales.
204. Granite—Mary Smoker's Creek, Stanley River, New South Wales.
205. Granite—Balfour Creek, County Burnett (?), New South Wales.
206. Granite—Mitchell's Creek, County Lincoln, New South Wales.
207. Granite—North-west of Macquarie Gap, Coolah, New South Wales.
208. Granite—Macquarie Gap, near Coolah, New South Wales.
209. Granite—Three miles from Talbragar, County Bligh, New South Wales.
210. Granite—Dungeary, County Gordon, New South Wales.
211. Granite—Near Durander, Stanley River, New South Wales.
212. Granite—*From Conglomerate*—Gravesend, M'Intyre River.

QUARTZ PORPHYRY, ELVANITE.

213. Quartz Porphyry—Wilsdurf, Saxony, Germany.
214. Quartz Porphyry—Seevin, Upper Rhine, Germany.
215. Quartz Porphyry—Remanvillers, Vosges, France.
216. Quartz Porphyry—Labresse, Vosges, France.
217. Quartz Porphyry—Dornreichenbach, Saxony, Germany.
218. Quartz Porphyry—Mte.-de-Vanne, Haute-Saône, France.
219. Quartz Poryhyry—Gerssingen, Saxony, Germany.
220. Quartz Porphyry—Altenberg, Saxony, Germany.
221. Quartz Porphyry—Rupt, Vosges, France.
222. Quartz Porphyry—Würtzburg, Bavaria, Germany.
223. Quartz Porphyry—Dona, Saxony, Germany.
224. Quartz Porphyry—Gerardmer, Vosges, France.
225. Quartz Porphyry—St. Etienne, Vosges, France.
226. Quartz Porphyry—*Altered, schistose*—Rupt, Vosges, France.
227. Claystone Porphyry—*Argillophry*—Wissembach, Vosges, France.
228. Quartz Porphyry—*Schistose*—Tyrol, Austria.
229. Quartz Porphyry—Tharand, Saxony, Germany.

AUSTRALIAN PORPHYRY.

230. Porphyry—Lawler's Station, Bayabajon, Mary River, County Gordon, New South Wales.

231. Porphyry—Between Murrawulga and Guntawang, County Bligh, New South Wales.

232. Porphyry—*Black compact*—Bidywiandi, Namoi River, New South Wales.

233. Porphyry—*Green, white, and red*—Bidywiandi, Namoi River, New South Wales.

234. Porphyry—Ranges east of Thorobri, Namoi River, New South Wales.

235. Porphyry—*Cream-colour*—Mount Robinson, County Cowley (?), New South Wales.

236. Porphyry—Yarranganwandi, New South Wales.

237. Porphyry—*Red*—Mount Robinson, County Pottinger, New South Wales.

238. Porphyry—*Black*—Ranges east of Thorobri, Namoi River, New South Wales.

239. Porphyry—Berrigal, Nandawar Range, Liverpool Plains, New South Wales.

240. Porphyry—Brugera, New South Wales.

241. Porphyry—Between Kilcoy and Coongabal, New South Wales.

242. Poryhyry—Between Kilcoy and Coongabal, New South Wales.

243. Porphyry—*Augitic*—Mount Robinson, Namoi River, New South Wales.

244. Porphyry—Coongabal, Stanley Range, New South Wales.

245. Porphyry—*Augitic*—Mount Robinson, Namoi River, New South Wales.

246. Porphyry—*Mottled green and red*—Bidywiandi, Port Curtis, Queensland.

247. Porphyry—*With green earth*—Mount Robinson, Namoi River.

248. Porphyry—*Red*—Ranges east of Thorobri, Namoi River, New South Wales.

249. Porphyry—*Mottled green and white*—Bidiwiandi, Port Curtis, Queensland.

250. Porphyry—*Blue coloured base*—West of Tangona, east side of Namoi River, New South Wales.

251. Porphyry—Mount Lachlan, New South Wales.

252. Porphyry—*Mottled green and white* — Bidiwiandi, Port Curtis, Queensland.

253. Porphyry— *White and red*—Mount Robinson, New South Wales.

254. Porphyry—Rocky Creek, Nandawar Range, Liverpool Plains, New South Wales.

255. Porphyry—*Green and red, with lilac-coloured Agate*—Bidiwiandi, Port Curtis, QUEENSLAND.

256. Porphyry—Between Kilcoy and Coongabal, NEW SOUTH WALES.

257. Porphyry—*Black*—Ranges east of Thorobri, Namoi River, NEW SOUTH WALES.

258. Porphyry—*White*—Mount Robinson, Namoi River, NEW SOUTH WALES.

259. Porphyry—*White and red*—Mount Robinson, Namoi River, NEW SOUTH WALES.

260. Porphyry—*White*—Mount Robinson, Namoi River, NEW SOUTH WALES.

261. Porphyry—Brugera, NEW SOUTH WALES.

262. Porphyry—*Blue*—West of Tangona, east side of Namoi River, NEW SOUTH WALES.

263. Porphyry—Between Murrawulga and Guntawang, County Bligh, NEW SOUTH WALES.

264 & 265. Porphyry—*Mottled green and red, with lilac-coloured Agate*—Port Curtis, QUEENSLAND.

FELSTONE.

FELSITE ROCK, AND FELSITE—SCHIST, PETROSILEX, EURITE, AND HALLEFLINTA.

Felsitfels und Felsteinschiefer (*Germ.*)

266. Felstone—*Porphyritic*—Rochesson, Vosges, FRANCE.

267. Felstone—*Porphyritic*—Rochesson, Vosges, FRANCE.

268. Felstone—*Porphyritic*—Rochesson, Vosges, FRANCE.

269. Felstone—*Porphyritic*—Rochesson, Vosges, FRANCE.

270. Felstone—*Porphyritic and amphibolitic*—Gerardmer, Vosges, FRANCE.

271. Felstone—*Compact Eurite*—Rochesson, Vosges, FRANCE.

272. Felstone—*Schistose Eurite*—Rochesson, Vosges, FRANCE.

273. Felstone—*Eurite*—Gerardmer, Vosges, FRANCE.

274. Felstone—*Amphibolitic*—Sapoix, Vosges, FRANCE.

275. Felstone—*Eurite*—Rothau, Vosges, FRANCE.

276. Felstone—*Eurite*—Rupt, Vosges, FRANCE.

277. Felstone—*Spotted Eurite*—Renfaing, Vosges, FRANCE.

278. Felstone—*Granitic Eurite*—Tresse, Vosges, FRANCE.

279. Felstone—*Micaceous Eurite*—Rémiremont, Vosges, FRANCE.

280. Felstone—*Porphyritic and Quartziferous Eurite*—Labresse, Vosges, FRANCE.

281. Felstone Proper or Petrosilex—Moosch, Upper Rhine, GERMANY.

PITCHSTONE AND PITCHSTONE PORPHYRY.

Pechstein und Pechstein Porphyr (*Germ.*) Rétinite (*Fr.*)

282. **Pitchstone**—Meissen, Saxony, GERMANY.
283. **Pitchstone**—Zwickau, Saxony, GERMANY.
284. **Pitchstone**—*Porphyritic*—Spechthausen, Saxony, GERMANY.
285. **Pitchstone**—Zwickau, Saxony, GERMANY.
286. **Pitchstone**—Meissen, Saxony, GERMANY.

METAMORPHIC CRYSTALLINE SCHISTS.

CRYSTALLINE SCHISTS, RICH IN FELSPAR.

GRANULITE AND GNEISS.

Same in French and German

Granulite, Leptynite, Granulit, Weisstein (*Germ.*) Leptynite (*Fr.*)

287. **Granulite**—*Micaceous*—St. Etienne, Vosges, FRANCE.
288. **Granulite**—*Maculated*—Gerbcépal, Vosges, FRANCE.
289. **Granulite**—*Graphitic*—Letholy, Vosges, FRANCE.
290. **Granulite**—*With Garnets*—St. Etienne, Vosges, FRANCE.
291. **Granulite**—*Altered*—Docelles, Vosges, FRANCE.
292. **Granulite**—*Ordinary*—Xertiguy, Vosges, FRANCE.
293. **Granulite**—*With Disthene*—Chemnitz, Saxony, GERMANY.
294. **Granulite**—Litholy, Vosges, FRANCE.
295. **Granulite**—*Micaceous, with Cordierite*—Gerardmer, Vosges, FRANCE.
296. **Gneiss**—Mordgrund, Saxony, GERMANY.
297. **Gneiss**—Freiberg, Saxony, GERMANY.
298. **Gneiss**—St. Nabord, Vosges, FRANCE.
299. **Gneiss**—*Graphitic*—Visembach, Vosges, FRANCE.
300. **Gneiss**—*Ordinary*—Rupt, Vosges, FRANCE.
301. **Gneiss**—*Ordinary*—Gerbépal, Vosges, FRANCE.
302. **Gneiss**—Freiberg, Saxony, GERMANY.
303. **Gneiss**—Gerardmer, Vosges, FRANCE.
304. **Gneiss**—*With Garnet*—St. Marie aux Mines, Elsass, GERMANY.
305. **Gneiss**—Murrumbidgee River, NEW SOUTH WALES.

CRYSTALLINE SCHISTS, RICH IN QUARTZ.

MICA SCHIST, QUARTZ SCHIST, ITACOLUMITE.

Glimmerschiefer (*Germ.*) Micaschiste (*Fr.*)

306. **Mica Schist**—New South Wales.
307. **Mica Schist**—New South Wales.
308. **Mica Schiste**—Neurum Neurum, Stanley River, New South Wales.
309. **Mica Schiste**—Schmiedewalde, Saxony, Germany.
310. **Mica Schiste**—*Spotted*—Nossen, Germany.
311. **Mica Schiste**—Lyon, France.

QUARTZ SCHIST, OR QUARTZITE.

Quartzschiefer (*Germ.*) Quartz schisteux (*Fr.*)

312. **Quartzite**—*Var. of Quartz Schiste—Breccia*—St. Maurice, Vosges, France.
313. **Quartzite**—Hautduroc, Vosges, France.
314. **Quartzite**—Kleinschirma, near Freiberg, Saxony. Germany.
315. **Quartzite**—Hautduroc, Vosges, France.
316. **Quartzite**—Vald'ajol, Vosges, France.
317. **Quartzite**—Zwickau, Saxony, Germany.
318. **Quartzite**—From island in Montague Sound, north-west Coast of Australia.
318a. **Quartzite**—Faymont, Vosges, France.
318b. **Quartzite**—*Of the Red Sandstone*—Arnould, Vosges, France.
318c. **Quartzite**—*Fossiliferous—From the Lower Devonian Sandstone formation*—Kahleberg, Hartz, Germany.

ITACOLUMITE.

This rock, which occurs in Brazil with native Gold and Diamond, is not represented in the collection.

CHLORITE, TALC, AND HORNBLENDE GROUP.

CHLORITE SCHIST AND POTSTONE.

Chloriteschiefer und Topfstein (*Germ.*) Schiste chloritique (*Fr.*)

319. **Chlorite Schist**—Hartha, Saxony, Germany.
320. **Chlorite Schist**—Hartha, Saxony, Germany.

HORNBLENDE SCHIST AND HORNBLENDE ROCK.

Hornblendeschiefer und Hornblendefels, Amphibolet (*Germ.*)
Schiste amphibolique et Amphibolithe (*Fr.*)

321. **Hornblende Schist**—Plauenscher Grund, Saxony, GERMANY.
322. **Hornblende Schist**—Campiglia, Toscana, ITALY.
323 **Hornblende Schist**—*With Erubescite and Copper Pyrites*—Toscana, ITALY.
324. **Hornblende Schist**—Ballon de St. Maurice, Vosges, FRANCE.
325. **Hornblende Schist**—Robschütz, Saxony, GERMANY.

SCHISTS INDISTINCTLY CRYSTALLINE.

ARGILLACEOUS MICA SCHIST, PHYLLITE.

Thonglimmerschiefer Phyllit, Urthonschiefer (*Germ.*) Phyllade (*Fr.*)

326. **Phyllite or Argillaceous Mica Schist**—Bussang, Vosges, FRANCE.
327. **Phyllite**—Andlan, Elsass, GERMANY.
328. **Phyllite**—*Variety Ottrelite Schist*—Ottre, BELGIUM.
329. **Phyllite**—*Satin Schist*—Lubine, Vosges, FRANCE.
330. **Phyllite**—*Maculated*—Zankerode, Saxony, GERMANY.
330a. **Phyllite**—*With Pyrites*—Fumay, Ardennes, FRANCE.
331. **Phyllite**—*Coticule*—Vieil Salm, BELGIUM.
331a. **Phyllite**—*Alum Shale*—Nossen, Saxony, GERMANY.

SEDIMENTARY AND FRAGMENTAL ROCKS.

ARGILLACEOUS GROUP.

Thonschiefer (*Germ.*) Ardoisier (*Fr.*)

332. **Clay Slate, Schiste Argilleux, Schiste**—Clausthal, Hartz, GERMANY.
333. **Roofing Slate**—Angers, BELGIUM.
334. **Roofing Slate**—Ardennes, FRANCE.
335. **Roofing Slate**—Angers, BELGIUM.
335a. **Roofing Slate**—Victoria, AUSTRALIA.

ARGILLACEOUS SHALE, OR SHALE.

Schieferthon (*Germ.*) Argille schisteuse (*Fr.*)

336. **Gas Shale**—*From the Magnesian Limestone formation*—Muse, Saône and Loire, FRANCE.
337. **Gas Shale**—*From the Kimmeridge Clay*—Dorsetshire, ENGLAND.

338. **Bituminous Shale**—Dorsetshire, ENGLAND.

339. **Coal Shale or Coal Schist**—*Coal beds*—Mons, BELGIUM.

339a. **Coal Shale***—Newcastle, NEW SOUTH WALES.

* A large collection of Australian specimens, chiefly from the Newcastle Coal beds, are exhibited in a separate cabinet in the new wing.

340. **Coal Shale or Coal Schist**—*Coal beds or Coal measures*—Cransac, Aveyron.

341. **Calcareous Schist or Calc Schist**—Vachembach, Vosges, FRANCE.

342. **Calcareous Schist or Calc Schist**—*From Magnesian Limestone formation*—Frankenberg, Hessen, GERMANY.

343. **Magnesian Schiste**—Paris, FRANCE.

344. **Magnesian Schiste**—*With Cyclostoma Shells*—St. Denis, Paris, FRANCE.

345. **Calcareous Schiste**—*With Dendrites*—Cirin, Airy, FRANCE.

346. **Metamorphic Schiste**—Toscana, ITALY.

347. **Burnt Shale**—*With plant impressions*—Telegraph Hill, Newcastle, NEW SOUTH WALES.

348. **Shale**—*Altered*—Summit of Mount Lareom, QUEENSLAND (?).

349. **Shale**—*Altered*—Namoi River, NEW SOUTH WALES.

350. **Shale**—*Altered, dendritic Manganese*—Namoi River, NEW SOUTH WALES.

351. **Shale**—*Feruginous, with plant remains*—Kihi Creek, near Bidleyena, NEW SOUTH WALES.

CLAY AND LOAM.

Thon und Lehm (*Germ.*) Argille (*Fr.*)

352. **Clay**—*Sandy, from the Gault formation*—St. Florentin, Yonne, FRANCE.

353. **Plastic Clay**—*Etage Suessonien*—Paris, FRANCE.

354. **Plastic Clay**—*Etage Suessonien*—Meudon, FRANCE.

355. **Plastic Clay**—*Etage Suessonien*—Paris, FRANCE.

CLAYSTONE AND HARDENED CLAY.

356. **Websterite**—*Concreted*—Paris, FRANCE.

357. **Clay**—*Hardened and banded*—Bruyères, FRANCE.

358. **Fucoidal Clay**—*With remains of Fucodes—From the Aptien formation* (*Etage Aptien*)—Marolles, Aube, FRANCE.

359. **Clay**—*Hardened*—Vald'ajol, Vosges, France.

360. **Hardened Clay**—Vald'ajol, Vosges, France.

360a. **Argillaceous Rock**—*Of columnar form, from having been in contact with Basalt*—Eifel, Prussia, Germany.

MARLS.

Marl, Mergel (*Germ.*) Marne (*Fr.*)

361. **Marl**—*From the Parisian formation*—Paris, France.

362. **Calcareous Marl**—*From the Parisian formation*—Paris, France.

363. **Calcareous Marl**—*From the Parisian formation, with remains of fresh-water Shells*—Paris, France.

364. **Marl**—*With remains of marine Shells, from the Parisian formation*—Argenteuil, France.

365. **Green Marl**—Montmartre, Paris, France.

LIMESTONE GROUP.

LIMESTONE, DOLOMITE, GYPSUM, ANHYDRITE.

Limestone, Kalkstein (*Germ.*) Calcaire (*Fr.*)

366. **Calciphyre**—*Granular Limestone, with Garnet, Pyroxene, or Felspar*—Auerbach, Hessen, Germany.

367. **Granular Limestone or Cipolino**—*A granular Limestone, with Mica*—Toscana, Italy.

369. **Ophicalcite**—*A compound of Limestone and Serpentine*—

370. **Cherty Limestone**—Meissen, Saxony, Germany.

371. **Ferruginous Limestone**—Marelle, Aube, France.

372. **Devonian Limestone**—*With Encrinites*—Russ, Vosges, France.

373. **Lamellated Limestone**—Chepal, Vosges, France.

374. **Marble**—Orange, New South Wales.

375. **Marble**—Orange, New South Wales.

376. **Marble**—Orange, New South Wales.

377. **Marble**—Orange, New South Wales.

378. **Marble**—Orange, New South Wales.

379. **Marble**—Orange, New South Wales.

380. **Marble**—Orange, New South Wales.

381. **Marble**—Orange, New South Wales.

382. **Marble**—Orange, New South Wales.

383. **Marble**—Orange, New South Wales.
384. **Marble**—Orange, New South Wales.
385. **Marble**—Orange, New South Wales.
386. **Marble**—Orange, New South Wales.
387. **Marble**—Orange, New South Wales.
388. **Marble**—Orange, New South Wales.
389. **Marble**—Orange, New South Wales.
390. **Marble**—Orange, New South Wales.
391. **Marble**—Orange, New South Wales.
392. **Marble**—Orange, New South Wales.
393. **Marble**—Calliope River, Port Curtis, Queensland.
394. **Marble**—Near Bungaboormal, County Lincoln, New South Wales.
395. **Marble**—Near Bungaboormal, County Lincoln, New South Wales.
396. **Marble**—Calliope River, Port Curtis, Queensland.
397. **Marble**—King's County, Ireland.
398. **Marble**—County Galway, Ireland.
399. **Marble**—County Meath, Ireland.
400. **Marble**—County Cork, Ireland.
401. **Marble**—County Galway, Ireland.
402. **Marble**—Sicily, Italy.
403. **Marble**—Porto Vena, Italy.
404. **Marble**—Carrara, Italy.
405. **Marble**—Italy.
406. **Marble**—Italy.
407. **Marble**—Italy.
408. **Black Marble**—*From the Mountain Limestone formation*—Sablé, Sarthe, France.
409. **Compact Limestone**—Gravesend, M'Intyre River, New South Wales.
410. **Limestone**—*Containing Pentamerus*—Bell River, Wellington, New South Wales.
411. **Compact Limestone**—Bell River, New South Wales.
412. **Compact Limestone**—New South Wales.
413. **Compact Limestone**—Mount Elizabeth, Port Curtis, Queensland.
414. **Marble**—New South Wales.
415. **Compact Limestone**—Mount Elizabeth, Port Curtis, Queensland.
416. **Limestone**—*Containing Heliolites and Crinoid stems*—Nurca, New South Wales.
417. **Limestone**—Gogoomgan, Wide Bay District, Queensland.
418. **Ferruginous Limestone**—Bell River, New South Wales.

419. Limestone—Mount Elizabeth, Port Curtis, QUEENSLAND.
420. Limestone—Bell River, NEW SOUTH WALES.
421. Limestone—Stony Creek, Bell River, NEW SOUTH WALES.
422. Limestone—NEW SOUTH WALES.
423. Limestone—*Coral, with Syringopora*—NEW SOUTH WALES.
424. Limestone—*Marble*—Orange, NEW SOUTH WALES.
425. Limestone—*Oolitic*—NEW SOUTH WALES.
426. Limestone—*Oolitic*—Horton River, NEW SOUTH WALES.
427. Limestone—Bell River, NEW SOUTH WALES.
428. Dolomitic Limestone—Robache, near St. Dié, Vosges, FRANCE.
429. Cellular Magnesian Limestone—*From the Keuper formation*—Mirecourt, Vosges, FRANCE.
430. Striped Magnesian Limestone—*From the Keuper formation*—Mirecourt, Vosges, FRANCE.
431. Upper Magnesian Limestone—*From the Keuper formation*—Fontaine, Haute-Saône, FRANCE.
432. Upper Magnesian Limestone—*From the Keuper formation*—Mirecourt, Vosges, FRANCE.
433. Compact Limestone—*Upper Neocomien formation*—Escragnolles. FRANCE.
434. Compact Limestone—*From the Parisian formation*—St. Germain-en-Laye, FRANCE.
435. Compact Limestone—*From the Parisian formation*—St. Germain-en-Laye, FRANCE.
436. Shell Limestone—*Muschelkalk formation* — Dompaire, Vosges, FRANCE.
437. Shell Limestone—*Muschelkalk formation* — Doguevilles, Vosges, FRANCE.
438. Shell Limestone—*With Encrinites*—Girecourt, Vosges, FRANCE.
439. Shell Limestone—*With Encrinites, Muschelkalk formation*—Chavelôt, Vosges, FRANCE.
440. Shell Limestone—*Breccia, with fragments of Encrinites, from the Muschelkalk formation*—Girmont, Vosges, FRANCE.
441. Compact Shell Limestone—*Muschelkalk formation* — Darmenlet, Vosges, FRANCE.
442. Shell Limestone—*Breccia*—Rehainviller, near Lunéville, FRANCE.
443. Lumachelle Limestone—*From the Lias*—St. Afrique, Aveyron, FRANCE.
444. Grey Oolitic Limestone—*From the inferior Oolite*—Besançon, FRANCE.
445. Oolitic Limestone—*With Encrinites*—Dijon, FRANCE.
446. Sub-Oolitic Limestone—*From the Great Oolite*—ENGLAND.

147. Sub-Oolitic Limestone—*From the Parisian group*—Villejuif, Paris, France.

148. Limestone—*With Encrinites, from the Upper Oxford formation*—Dijon, France.

149. Jura Marble—*Coralline Limestone*—Salins, Jura, France.

150. Coralline Oolite—Malton, Yorkshire, England.

151. Marble—*Yellow Breccia*—Pyrenees, Spain.

152. Lithographic Limestone—*From the Coral formation, Étage Corallien*—Solenhofen, Bavaria, Germany.

153. Shell Limestone—*With Stylolites, from the Muschelkalk*—Göttingen, Hanover, Germany.

154. Grey Chalk—Mount St. Catherine, Rouen, France.

155. White Chalk—*From the upper Chalk formation*—Meudon, Seine, France.

156. White Chalk—*From the upper Chalk formation*—Meudon, Seine, France.

157. Lumachelle Limestone—*Aptien formation*—Gurgy, Yonne, France.

158. Coarse Limestone—*Étage Parisien*—Paris, France.

159. Coarse Limestone—*Étage Parisien*—Paris, France.

160. Filter Limestone—*Étage Parisien* — Villers-sous-St.Leu, Oise, France.

161. Building Limestone—*Étage Parisien*—Pontoise, France.

162. Cerithium Limestone—*Étage Parisien*—Meudon, France.

163. Fresh-water Limestone—Rilly, near Rheims, France.

164. Coarse Limestone—*With Shells*—Paris, France.

165. Fresh-water Limestone—Paris, France.

166. Fresh-water Limestone—Etampes, France.

167. Salt-water Limestone—Mainz, Germany.

168. Limestone-crust—*Covering a leaf from the Alluvium*—Cannstadt, Wurtemberg, Germany.

DOLOMITE, MAGNESIAN LIMESTONE.

Dolomit (*Germ.*) . Dolomie (*Fr.*)

169. Predazzite—*A variety of Dolomite*—Predazzo, Tyrol, Austria.

170. Cellular Dolomite—*From the Zechstein formation*—Grund, Hartz, Germany.

171. Dolomite—Schlaggenwald, Bohemia.

GYPSUM AND ANHYDRITE.

Gypsum. Gyps (*Germ.*) Gypse (*Fr.*)

472. Gypsum—*Calcareous*—Montmartre, Paris, FRANCE.
473. Gypsum—*Calcareous*—Montmartre, Paris, FRANCE.
474. Gypsum—Rudain, Hungary, AUSTRIA.
475. Granular Gypsum, or Alabaster—Toscana, ITALY.

ANHYDRITE, MURIACITE, KARSTENITE.

Anhydrit, Muriacit, Karstenit (*Germ.*) Anhydrite (*Fr.*)

No specimen in the collection.

SANDSTONE AND GRITSTONE.

Sandstein, Psammit (*Germ.*) Grès (*Fr.*)

Varieties of Australian Sandstone.

476. Sandstone—Barrabool Hills, VICTORIA.
477. Sandstone—Barrabool Hills, VICTORIA.
478. Lilac-coloured Micaceous Sandstone—Well, Mangullia, County Bligh, NEW SOUTH WALES.
479. Sandstone—*Containing Quartz Pebbles*—Well, Mangullia, County Bligh, NEW SOUTH WALES.
480. Sandstone—M'Laby's Creek, County Bligh, NEW SOUTH WALES.
481. Friable Sandstone—M'Laby's Creek, County Bligh, NEW SOUTH WALES.
482. Sandstone—Little River, County Gordon, NEW SOUTH WALES.
483. Brilliant Sandstone—Mangullia, County Bligh, NEW SOUTH WALES.
484. Sandstone—*Partially vitrified*—Goodencur Creek, County Bligh, NEW SOUTH WALES.
485. Sandstone—Summerhill Creek, NEW SOUTH WALES.
486. Sandstone—*Apparently the débris of Granite*—Guntawang, County Bligh, NEW SOUTH WALES.
487. Ferruginous Sandstone—Marbry, County Bligh, NEW SOUTH WALES.
488. Ferruginous Sandstone—Warrambangle, County Gowan, NEW SOUTH WALES.
489. Sandstone—Near Bothero, County Napier, NEW SOUTH WALES.
490. Sandstone—Base of Mount Arthur, County Gordon, NEW SOUTH WALES.
491. Sandstone—*Altered*—Mount Dewingiang, County Gordon, NEW SOUTH WALES.

492. Sandstone—*Fine white, from bed 5 feet thick*—Dubbo, County Gordon, New South Wales.

493. Sandstone—*Red gritty*—near Dubbo, County Gordon, New South Wales.

494. Sandstone—*Altered, dark ferruginous grit*—Wylandra Creek, Dubbo, County Gordon, New South Wales.

495. Sandstone—*Argillaceous, with flinty fracture, and of a bright red colour*—Wylandra Creek, Dubbo, County Gordon, New South Wales.

496. Sandstone—*Buff, argillaceous, with flinty fracture*—Wylandra Creek, Dubbo, County Gordon, New South Wales.

497. Sandstone—*Slightly altered by proximity of Granite*—Dungary, County Gordon, New South Wales.

498. Sandstone—*Altered*—Dungary, County Gordon, New South Wales.

499. Sandstone—*Altered*—Dungary, County Gordon, New South Wales.

500. Sandstone—*Vitrified*—Dungary, County Gordon, New South Wales.

501. Sandstone—Barrabool Hills, Victoria.

502. Sandstone—*Exhibiting degrees of vitrification and dissipation of Oxide of Iron*—Dungary, County Gordon, New South Wales.

503. Sandstone—*Exhibiting degrees of vitrification and a more complete dissipation of Iron*—Dungary, County Gordon, New South Wales.

504. Sandstone—*Altered*—Glasshouses, Moreton Bay, Queensland.

505. Sandstone—*Altered*—Glasshouses, Moreton Bay, Queensland.

506. Sandstone—*Altered*—Burival, Moreton Bay, Queensland.

507. Sandstone—*Gritty*—near Bidleyena, Kihi Creek, New South Wales.

508. Sandstone—Mount Byron, New South Wales.

509. Sandstone—*Altered*—near Bonera, New South Wales.

510. Sandstone—*Altered*—near Boree Boree, New South Wales.

Varieties of Sandstone from other Countries.

QUARTZ PSAMMIT, QUARTZ SANDSTONE, GRAUWACKE SANDSTONE.

511. Psammit—*Porphyritic*—Thann, Elsass, Germany.

512. Psammit—Massevaux, Elsass, Germany.

513. Psammit—Rauspach, Elsass, Germany.

514. Psammit—Bitchweiler, Elsass, Germany.

515. Psammit—Clausthal, Hartz, Germany.

516. Psammit—*Quartz Psammit*—Plains of "Belles filles," Haute-Saône, France.

517. **Psammit**—Bitschweiler, Elsass, GERMANY.
518. **Psammit**—Thann, Elsass, GERMANY.
519. **Psammit**—Tuscany, ITALY.

FELSPATHIC SANDSTONE, ARKOSE.

520. **Arkose**—Giromaguy, Elsass, GERMANY.
521. **Arkose**—Dommartin, Vosges, FRANCE.
522. **Arkose**—Dommartin, Vosges, FRANCE.
523. **Arkose**—Lützelhausen, Elsass, GERMANY.

ARGILOLITE, ARGILLACEOUS SANDSTONE.

524. **Argilolite**—Lützelhausen, Elsass, GERMANY.
525. **Argilolite**—Lützelhausen, Elsass, GERMANY.

RED SANDSTONE.

Grès rouge (*Fr.*) Rother Sandstein (*Germ.*)

526. **Red Sandstone**—*Breccia, in Granite*—Anould, Vosges, FRANCE.
527. **Red Sandstone**—*Compact, with fine silicious grains*—Dommartin, Vosges, FRANCE.
528. **Red Sandstone**—*Quartziferous and argillaceous*—Vald'ajol, Vosges, FRANCE.
529. **Red Sandstone**—*Argillaceous*—Rouchamp, Haute-Saône, FRANCE.
530. **Red Sandstone**—*Breccia, enveloped in Granite*—Sapoix, Vosges, FRANCE.
531. **Red Sandstone**—*Argillaceous, enveloped in altered Granite*—Gèrardmer, Vosges, FRANCE.

RED SANDSTONE, KNOWN AS "ROTH TODTLIEGENDES."

532, 533, & 534. **Psephite, or "Roth Todliegendes"**—*Composed of Red Sandstone, with angular fragments of Phillade, Granite, &c.*—Eisenach, Thuringia, GERMANY.

MILLSTONE GRIT.

Flötzleerer Sandstein (*Germ.*) Meulière (*Fr.*)

535. **Millstone Grit**—*Cellular*—La Fertè sous Zouarre, FRANCE.
536. **Millstone Grit**—*Compact fossiliferous*—Montmorency, FRANCE.
537. **Millstone Grit**—*With remains of Lymneus Shells*—Montmorency, FRANCE.
538. **Millstone Grit**—*Coal beds*—Matlock, Derbyshire, ENGLAND.

CARBONIFEROUS SANDSTONE.

539. **Anageniste**—Cransac, Aveyron, France.
540. **Anageniste**—Cransac, Aveyron, France.
541. **Coal Sandstone**—Grès houiller (*Fr.*)—Malbouhans, Haute-Saône, France.

VOSGESIAN SANDSTONE.

Grès vosgien (*Fr.*)

542. **Vosgesian Sandstone**—Near Plombières, France.
543. **Vosgesian Sandstone**—Vald'ajol, Vosges, France.
544. **Vosgesian Sandstone, or altered Silicious Sandstone**—Near Plombières, Vosges, France.

VARIEGATED SANDSTONE or NEW RED SANDSTONE.

Bunter Sandstein (*Germ.*) Grès bigarré (*Fr.*)

545. **Variegated Sandstone**—*Silicious, with mould or impression of Calamites*—Plombières, Vosges, France.
546. **Variegated Sandstone**—*With shells*—Ruaux, Vosges, France.
547. **Variegated Sandstone**—*With shells*—Ruaux, Vosges, France.
548. **Variegated Sandstone** — *Micaceous* — Luxeuil-les-bains, Vosges, France.
549. **Variegated Sandstone**—*Micaceous*—Les Forges, Vosges, France.
550. **Variegated Sandstone**—*Argillaceous*—Vossalonne, Vosges, France.
551. **Variegated Sandstone**—*Micaceous*—Vald'ajol, Vosges, France.
552. **Variegated Sandstone**—*Silicious*—Aydoiles, Vosges, France.
553. **Variegated Sandstone**—*Ordinary*—Rémiremont, Vosges, France.
554. **Variegated Sandstone**—*Old Red Sandstone?*—Frymont, Vosges, France.
555. **Variegated Sandstone**—*Micaceous*—Bellefontaine, Vosges, France.
556. **Variegated Sandstone**—*Spotted*—Soultz-les-bains, Vosges, France.
557. **Variegated Sandstone**—*Micaceous, with plant impressions*—Mirecourt, France.

QUADER SANDSTONE, or SQUARE-JOINTED SANDSTONE.

Quadersandstein (*Ger.*)

558. **Maculated Quader Sandstone**—Saxony, Germany.

FERRUGINOUS SANDSTONE.

Eisensandstein (*Germ.*) Grès ferrugineux (*Fr.*)

559. **Ferruginous Sandstone**—Paris, France.
560. **Ferruginous Sandstone**—Montmartre, Paris, France.

BEAUCHAMP SANDSTONE.

Grès de Beauchamp. Formation "Etage Parisien."

561. **Beauchamp Sandstone**—Beauchamp, Seine, France.

SHELL SANDSTONE.

Muschel Sandstein (*Germ.*) Grès coquillier (*Fr.*)

562. **Shell Sandstone**—Anvers, near Pontoise, France.
563. **Shell Sandstone**—Anvers, near Pontoise, France.

BRILLIANT SANDSTONE, SILICIOUS SANDSTONE, OR FONTAINEBLEAU SANDSTONE.

564. **Brilliant Sandstone**—Orsay, Seine, France.
565. **Brilliant Sandstone**—Etampes, France.
566. **Brilliant Sandstone** — *Brown variety* — Beynes, Seine-et-Oise, France.
567. **Brilliant Sandstone**—Etampes, Seine-et-Oise, France.

CALCAREOUS SANDSTONE.

Kalk sandstein (*Germ.*) Grès calcarifere (*Fr.*)

568. **Calcareous Sandstone**—Villejuif, Paris, France.

SAND.

Sand (*Germ.*) Sable (*Fr.*)

568a. **Sand**—Paddington, New South Wales.

CONGLOMERATES.

CONGLOMERATE, PUDDING-STONE.

Conglomerat, Puddingstein (*Germ.*) Conglomérat, Poudingue (*Fr.*)

569. Quartz Conglomerate—*With smooth fracture*—Little River, County Gordon, New South Wales.

570. Conglomerate—*Quartz Pebbles and Sandstone*—Dungarey, County Gordon, New South Wales.

571. Conglomerate—*Quartz Pebbles and Sandstone*—Dungarey, County Gordon, New South Wales.

572. Conglomerate—*Vitrified, the result of heat upon No.* 569—Dungarey, County Gordon, New South Wales.

573. Conglomerate—*More highly vitrified, the iron being entirely dissipated*—Dungarey, County Gordon, New South Wales.

574. Conglomerate—*Highly vitrified, but retaining iron*—Dungarey, County Gordon, New South Wales.

575. Conglomerate—*Vitrified*—Terryhihie, Liverpool Plains, New South Wales.

576. Conglomerate—Barlogie, New South Wales.

577. Conglomerate—Near Sammy's Flat, New South Wales.

578. Conglomerate—*Ferruginous*—Near Geary, upper fall of the Murrumbidgee, New South Wales.

579. Conglomerate—*Below Coal*—This rock appears to be identical with Nos. 539 and 540 of the Coal beds from Cransac, in France—Stony Creek, New South Wales.

580. Conglomerate—*Below Coal*—Black Creek, New South Wales.

581. Conglomerate—New South Wales.

582. Conglomerate—*Below Coal*—Tuggerah Beach, New South Wales.

583. Conglomerate—Near Stowe, Port Curtis, Queensland.

584. Conglomerate—*Cemented with Oxide of Iron*—Bungabormal, County Lincoln, New South Wales.

585. Conglomerate—Gravesend, M'Intyre River, New South Wales.

586. Conglomerate—Yarrangariwandi, County Pottinger, New South Wales.

587. Conglomerate—Mount Byron, New South Wales.

588. Vosgesian Sandstone Conglomerate—Near Saulxuros, France.

589. Conglomerate—*Syenitic*—Plauenscher, Grund, Saxony, Germany.

590. Conglomerate—*Ferruginous (now being formed at the bottom of the Seine, France)*—Paris, France.

BOULDERS AND PEBBLES.

Geschiebe und Gerölle (*Germ.*)

590a. **Boulder**—Nepean River, NEW SOUTH WALES.

BRECCIA.

Breccie (*Germ.*) Brèche, Brecciola (*Fr*).

591. **Petrosilicious Breccia**—Stancherles Mines, Haute-Saône, FRANCE.

592. **Petrosilicious Breccia**—La Milandre, Upper Rhine, GERMANY.

593. **Petrosilicious Breccia**—Felleringen, Elsass, GERMANY.

594. **Petrosilicious Breccia**—Bärenkopf, Elsass, GERMANY.

BONE BRECCIA.

594a to 594g. **Bone Breccia**—Wellington Caves, NEW SOUTH WALES.

ACCUMULATIONS

of heaps of loose fragments of stones or rubbish, naturally or artificially formed, such as tipping stones at the mouth of a mine or elevation, come under the fragmental series of rocks. This "rock" will grow in course of time to a considerable magnitude in Australia.

LAVA.

Lava is not a definite rock, but is the name given to every rock which has been originally poured forth from a volcano in a state of igneous fusion. Thus, we distinguish Dolerite Lava, Basalt Lava, Trachyte Lava, &c.

595 & 596. **Lava**—*Composed of Felspar and Pyroxene*—Roderberg, near Bonn, GERMANY.

597. **Lava**—Auvergne, FRANCE.

TUFA, OR TUFF.

Tuffbildungen (*Germ.*) Tuf (*Fr.*)

A.—*Volcanic Tufas, Basaltic and Trachytic.*

598. **Puzzulana**—A loosely coherent deposit of volcanic sand, very useful in the construction of hydraulic mortars.

B.—*Tuff formations of Plutonic Rocks.*

599. **Doleritic and Porphyritic Tufa**—Bilin, Bohemia, AUSTRIA.

600 & 601. **Tufa**—Rieden, Eifel, GERMANY.

SPILITE OR SCHALSTEIN.

So many rocks have been described under this name that the general description must be confined to this,—a laminated rock, interspersed with small particles of Calc Spar.

602. **Schalstein**—St. Diè, Elsass, GERMANY.
603. **Schalstein**—Lepuix, Elsass, GERMANY.
604. **Schalstein**—Bellebeauchamps, Haute-Saône, FRANCE.
605. **Schalstein**—La Puix, Elsass, GERMANY.
606. **Schalstein**—Clausthal, Hartz, GERMANY.
607. **Schalstein**—Kloster Zella, Saxony, GERMANY.

ROCKS OF SPECIAL CHARACTER OR BEDDING.

SERPENTINE GROUP.

SERPENTINE, OPHIOLITE.

Serpentin, Ophiolith (*Germ.*) Serpentine (*Fr.*)

608. **Serpentine**—Zöblitz, Saxony, GERMANY.
609. **Serpentine**—Zöblitz, Saxony, GERMANY.
610. **Serpentine**—Waldhenn, Saxony, GERMANY.
611. **Serpentine**—St. Etienne, Vosges, FRANCE.
612. **Serpentine**—St. Etienne, Vosges, FRANCE.
613. **Serpentine**—Liesey, Vosges, FRANCE.
614. **Serpentine**—St. Pierre, Elsass, GERMANY.
615. **Serpentine**—Odren, Elsass, GERMANY.
616. **Serpentine**—Waldheim, Saxony, GERMANY.
617. **Serpentine**—Narouel, Vosges, FRANCE.
618 & 619. **Serpentine**—Gerardmar, Vosges, FRANCE.
620. **Serpentine**—*Fibrous*—Bingera, NEW SOUTH WALES.
621. **Serpentine**—Bed of Caliope River, Port Curtis, QUEENSLAND.
622. **Serpentine**—Caliope River, Port Curtis, QUEENSLAND.
623. **Serpentine**—Bingera, New SOUTH WALES.
624. **Serpentine**—*With Epidote*—Mount Elizabeth, Port Curtis, QUEENSLAND.
625. **Serpentine**—Near Mount Elizabeth, Port Curtis, QUEENSLAND.
626. **Serpentine**—Caliope River, Port Curtis, QUEENSLAND.

GARNET GROUP.

EKLOGITE, OMPHACITE ROCK, SMARAGDITE ROCK, DISTHENE ROCK.

Eklogit, Omphacitefels, &c. (*Germ.*) Ecklogite, Omphacite (*Fr.*)

Occurs in Styria, Bohemia, &c.
(No specimen in the collection.)

EULISITE

occurs at Tunaberg, in Sweden.
(Not represented.)

GARNET ROCK.

Granatfels (*Germ.*) Grenatite (*Fr.*)

627. **Garnet Rock**—Near Rockhampton, QUEENSLAND. (Often mistaken for Tin Ore.)

KINZIGITE

is a rock found in the Black Forest, the Odenwald, in Bavaria and Spain.
(Not represented.)

DICHORITE ROCK

occurs in Saxony.
(Not represented.)

GREISEN AND SCHORL GROUP.

GREISEN.

Greisen (*Germ.*) Hyalomicte (*Fr.*)

628 & 629. **Greisen**—Altenberg, Saxony, GERMANY.

ZWITTER ROCK.

The Tin Ore of Altenberg is called Zwitter, and the rock containing it, therefore, "Zwitter Rock," by the miners there. This rock is not represented in the collection. The above rock, named Greisen, is frequently penetrated or associated with veins of Tin Ore, as in Zinnwald, in the Erzgebirge, Bohemia.

SCHORLACEOUS SCHIST AND SCHORL ROCK.

Schörlschiefer und Schörlfels (*Germ.*) Hyalotourmalithe (*Fr.*)

630. **Schorl Rock**—Auersberg, Saxony, GERMANY.

These Schorl Rocks, like Greisen, are almost always accompanied by, or associated with, beds of Tin Ore.

631. **Topaz Rock**—*A variety of Schorl Rock*—Schneckenstein, Saxony, GERMANY.

CARBONACEOUS GROUP.

PEAT, TURF, BOG.

Torf or Darg (*Germ.*) Tourbe (*Fr.*)

632. **Peat**—Valenciennes, FRANCE.

BROWN COAL OR LIGNITE.

Braunkohle und Lignit (*Germ.*) Lignite (*Fr.*)

633. **Lignite**—Habichtswald, Hesse, GERMANY.

BITUMEN AND MINERAL PITCH.

Bitumen und Erdpech, Asphalt (*Germ.*) Bitume, Malthe, Asphalte (*Fr.*)

634. **Bitumen**—Val Travers, Jura, SWITZERLAND.

COMMON COAL, BLACK COAL, OR PIT COAL.

Schwartzkohle oder Steinkohle (*Germ.*) Houille (*Fr.*)

635. **Coal**—*Showing vegetable structure*—Potschappel, Saxony, GERMANY.

635a. to 635d. **Coal**—Newcastle, NEW SOUTH WALES.

635e. **Coal**—Deloraine, TASMANIA.

ANTHRACITE.

Anthracit oder Glanzkohle (*Germ.*) Anthracite (*Fr.*)

636. **Anthracite**—Sablé, Sarthe, FRANCE.

637. **Anthracite**—Schoenfeld, Saxony, GERMANY.

638. **Anthracite**—Sablé, Sarthe, FRANCE.

GRAPHITE, PLUMBAGO.

Graphit (*Germ.*) Graphite (*Fr.*)

638a. **Graphite**—Tweed River, New South Wales.

PYROSCHIST, BITUMINOUS SHALE.

Brandschiefer (*Germ.*) Schiste bitumineux (*Fr.*)

639 & 640. **Kerosene Shale**—Hartley, New South Wales.

BURNT CLAYS.

Gerbannte Thone (*Germ.*) Thermantide (*Fr.*)

Local products of transmutation from clay rocks produced by burning Coal beds.

No specimen.

GUANO AND COPROLITE BEDS.

Guano und Koprolitenlager (*Germ.*) Guano (*Fr.*)

642. **Guano**—Gabo Island.

IRONSTONE GROUP.

BROWN HEMATITE, BRAUNEISENSTEIN, LIMONITE.

643. **Clay Ironstone**—*Columnar, from having been in contact with Basalt*—Eger, Bohemia.

RED HEMATITE.

Rotheisenstein (*Germ.*) Hématite rouge (*Fr.*)

644. **Red Hematite**—Töplitz, Bohemia, Austria.

644b. **Red Hematite**—Neverstone, Lancashire, England.

MAGNETIC IRONSTONE, MAGNETITE.

Magneteisenstein (*Germ.*) Magnetite, Fer oxydulé (*Fr.*)

645. **Magnetite**—Munroe, New York, United States.

SPATHIC IRON or SIDERITE.

Spatheisenstein (*Germ.*) Fer carbonatè, Siderose (*Fr.*)

646. **Siderose**—Baigorny, Pyrénées, France.

MINERALS AS ROCKS.

647. **Ice**—Not represented in the collection.

648. **Opal**—Libethen, Hungary, Austria.

648a. **Opal**—*A variety of specimens*—Dubbo, New South Wales.

648b. **Semi Opal, and Silicified Fossil Wood**—Numerous specimens from Australian localities.

648c. **Silicified Fossil Wood**—Le Mans Sarthe, France.

648d. **Silicified (coniferous) Fossil Wood**—Vald'ajol, Vosges, France.

649a to 649z. **Quartz**—Numerous specimens from Australian localities. Chiefly in fine Crystals or Gold-bearing.

650. **Amethyst**—Chemnitz, Hungary.

651 & 652. **Amethyst**—Dubbo and Bathurst, New South Wales.

653. **Chalcedony**—Hüttenberg, Germany.

654. **Chalcedony**—Uruguay, South America.

655. **Agate**—Schlottwitz, Saxony.

656-660. **Australian Agate**—From various localities.

661 & 662. **Flint or Silex**—Meudon, Seine, France.

663. **Flint Concretion**—Champigny, France.

664. **Corundum**—Unionville, Pennsylvania, United States.

665. **Fluor Spar**—Freiberg, Saxony, Germany.

666. **Fluor Spar**—Alston, Cumberland, England.

667 & 668. **Rock Salt**—Dieuze, Meurthe, France.

669. **Trona**—Occurs in Fezzan. Not represented in the collection.

670. **Barytes, or Heavy Spar**—Miess, Bohemia, Austria.

671. **Barytes**—Przibram, Bohemia, Austria.

672. **Apatite**—Arendal, Norway.

673. **Cryalite**—Ivikaet, Greenland.

674. **Aragonite**—Siegen, Prussia, Germany.

675. **Aragonite**—Alston, Cumberland, England.

676. **Ankerite**—(Not represented.)

677. **Magnesite**—(Not represented.)

678. **Diallogite, or Carbonate of Manganese**—Occurs chiefly in Hungary. (Not represented.)

679. **Malachite**—Cheshire, Connecticut, United States.
680. **Malachite**—Peabody Mine, New South Wales.
681. **Malachite**—Peak Downs Copper Mine, Queensland.
682. **Talc, or Steatite**—New South Wales.
683. **Meerschaum**—Natolia, Greece.
684. **Agalmatolite, or Figure Stone**—China.
685. **Kaolin, or Porcelain Clay**—New South Wales.
686. **Lithomarge**—Zwickau, Saxony, Germany.
687. **Lithomarge**—Schlaggenwald, Bohemia, Austria.
688. **Orthoclase, or Felspar**—Tyrol, Austria.
689. **Orthoclase, or Felspar**—Elbogen, Bohemia, Austria.
690. **Pycnite**—Occurs in the "Zwitter Rock" of Saxony. Not represented.
691. **Epidosite, or Pistacite Rock**—Campiglia, Italy.
692. **Lepidolite**—Occurs in Moravia. (Not represented.)
693. **Rock Soap**—Occurs at Bilin, Bohemia. (Not represented.)
694. **Bole**—Occurs in Limestone Rocks. (Not represented.)
695. **Fuller's Earth**—England.
696. **Ferreo Lithomarge**—Occurs at Zwickau, in Saxony. (Not represented.)
697. **Yellow Earth or Melinite**—Occurs at Auberg, Germany. (Not represented.)
698. **Galmey or Carbonate of Zinc**—Aachen, Germany.
699. **Rhodonite or Manganese Spar**—Occurs in Hungary, Massachusetts, United States, &c. (Not represented.)
700. **Lievrite or Ilvaite**—Occurs in the Island of Elba. (Not represented.)
701. **Manganese Ores**—Ilmenau, Germany.
702. **Red Zinc Ore**—Occurs at Franklyn, New Jersey, United States. (Not represented.)
703. **Galena**—Hartz, Germany.
704. **Antimony Glance**—Occurs in Hungary. (Not represented.)
705. **Arsenical Pyrites**—New South Wales.
706. **Marcassite or Hydrous Pyrites**—Littwitz, Bohemia, Austria.
707. **Iron Pyrites**—Siegen, Prussia, Germany.
708. **Iron Pyrites**—Island of Elba, Italy.
709. **Cinnabar**—Idria, Austria.
710. **Sulphur**—White Island, New Zealand.

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